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VOLUME XXXVII JANUARY 1958 NUMBER 10

CONTENTS

CAMG Operations in Atomic Age Warfare ---- 3
Strom Thurmond

The Soviet Army Logistical System ---- 9
Lieutenant Colonel Irving Heymont, Infantry

Pentomic Infantry Division in Combat ---- 19
Major John H. Cushman, Infantry

Administration in the Pentomic Infantry Division ---- 31
Lieutenant Colonel Milton A. Pullman, Infantry

The Army of the Future—Organization ---- 40
Major J. H. P. Curtis, MC, British Army

The Art of Military Command: An 11th Century View ---- 47
Robert Devereux

Limited War and the Scholars ---- 50
Colonel G. A. Lincoln, United States Army and
Lieutenant Colonel Amos A. Jordan, Jr., United States Army

Antiaircraft Defense ---- 61
Colonel Walter M. Vann, Artillery

MILITARY NOTES AROUND THE WORLD ---- 67

FOREIGN MILITARY DIGESTS ---- 78

The Graduated Deterrent ---- 78

Radio Communications in Modern War ---- 84

River Crossing in Atomic War ---- 88

The German Sixth Army on the Way to Catastrophe ---- 92

Operations of Marshal Von Manstein in Southern Russia December 1942 to March 1943 ---- 98

To Be or Not to Be? ---- 101

Is the Thermonuclear Ballistic Missile the "Ultimate Weapon"? ---- 105

BOOKS OF INTEREST TO THE MILITARY READER ---- 110

CAMG Operations In Atomic Age Warfare

Strom Thurmond

FROM the time the infantry first penetrates enemy-held territory, whether through an overseas, overland, or airborne movement, the commander is an occupier under the terms of international law.

Decisions must be made immediately by the commander regarding the people, government, and economy, not only to comply with the obligations imposed by international law and agreements, and to implement United States policy objectives for the area, but also to exploit for his direct benefit the potential of available resources in supporting and facilitating his combat operations.

To achieve combat success, he must destroy the enemy—and this includes the combat elements, the resources mobilized in their support, and the political agency which directs the effort against him.

Destruction is essential to winning a war. However, reason dictates that force must be applied with discrimination. Destruction must be measured and limited to actual requirements existing at the time. Hence the force applied need not necessarily be massive, neither need the destruction be total.

The application of even such controlled force as is required to win a war has a tremendous effect upon the civil population. The reaction of the affected civil population, in turn, can have a tremendous effect upon the commander's ability to continue the application of the required force.

Consequently, the commander's decisions are influenced not only by his own and the enemy's relative combat power, but also by the civil characteristics of the area of combat operations. In his estimates of the situation he carefully weighs civil affairs and military government (CAMG) factors along with those dealing with personnel, intelligence, operations, and logistics.

CAMG planning must be constant, continuous, and in full coordination with all other planning in order that CAMG operations may best contribute to the over-all mission of the commander. The objective of CAMG planning is to ensure support of tactical and logistical operations, as well as to resolve the civilian problems which handicap or interfere with tactical and logistical operations.

Equally valid for atomic age warfare is Clausewitz' summation of the over-all objectives of warfare. These objectives are threefold: *one*, to conquer and destroy the armed power of the enemy; *two*, to take possession of his material and other sources of strength; and *three*, to gain public support. These objectives are inherent in the mission of the Army, which

The effect of atomic warfare on the civil populace will so increase the commander's problems and responsibilities in this field that success or failure may depend upon civilian control and management measures

is "to defeat the enemy forces in land combat and gain control of the land and its people."

However, as the scope of warfare enlarges with the appearance of atomic weapons of increased destructiveness, so the scope of the commander's CAMG responsibilities to the population becomes correspondingly intensified. Modern military operations, even if carried out with measured discrimination, will create civilian problems of unparalleled magnitude.

Atomic Age CAMG Problems

It would be well to examine some of these problems, essentially civilian in nature, which will confront a commander in the conduct of his military operations on the atomic battlefield.

Civilians, in larger numbers perhaps than ever encountered before, will suffer the effects of war in personal loss, injury, deprivation, and lack of the barest essentials of life. In addition, they will lack the guidance, assistance, or control normally provided at the local levels of government.

Continuing damage will contribute to mass hysteria and tend to convert the previously normal populace into an uncontrolled horde. The populace of an area devastated by atomic weapons will seek to flee further injury with their possessions still intact, and they will obtain, by any means possible, that which is necessary to remain alive.

From the commander's point of view, what will be the effect of the problems posed by these civilians on his combat operations? The answer is apparent.

They will clutter the roads and interfere with or prevent the essential movement of troops and supplies. Often they are injected directly into the combat operation either deliberately by the enemy, or by their attempts to evade being engulfed by the enemy and to escape from enemy-held territory.

These civilians will require amazing tonnages of military supplies merely to be kept alive, and can compel a diversion of combat troops to protect lines of communication and supply installations from their pilferage tendencies in order to survive. They can require a similar diversion of troops to neutralize guerrilla action, fomented by undetected enemy agents among them.

They can do all these things and more.

They can almost stop a military operation, unless proper action is taken to anticipate and plan in advance, as a part of the military action, the CAMG measures that will effectively counteract these otherwise probable conditions.

CAMG Measures

The commander's CAMG operations are not limited to civil control and relief measures. His courses of action are extremely varied in scope and in possibilities, as the following paragraphs serve to illustrate.

In coordination with counterintelligence agencies, civilians are screened to ensure the detection of enemy agents and the prevention of sabotage and rear area disorders. Significantly, the extensive CAMG organization, functioning constantly at

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the grass roots level in enemy territory, constitutes an effective source of political and military intelligence, including technical intelligence which is important to the combat effort.

Local civil defense and damage control activities, including personnel and equipment, are coordinated with those of the United States forces. Steps are taken to enforce directives regarding such matters as blackout, curfew, and civilian circulation, and to maintain a condition of public order and safety among the civilians.

Information media are exploited to inform the civil populace of the purposes and aims of the United States effort, and to improve the relations between our forces and the people of the country with which we are at war.

Resources of the country are mobilized in support of military requirements, as well as to meet minimum essential civilian needs and thereby avoid a drain upon United States resources.

Human Nature Unchanged

The civilian problems of the future combat commander will confirm the fact that "Although weapons change, human nature remains the same."

It is evident that modern nuclear weapons and highly technical military forces will require mobilization of the full industrial and resource potential of a nation involved in war. It is evident, also, that the threat alone of the use of atomic devices affects nations as well as international balances. Consequently, under such conditions it is even more evident that the combat commander must conduct his operations with full recognition of the effect upon the population involved and their political, economic, and governmental structures, if ultimate victory is, in fact, to be achieved.

Throughout history, successful military commanders—such as Julius Caesar and Alexander of Macedonia—always have recognized the problem of controlling the populace, and took measures appropriate to the state of weapons development of their time to handle the civilian problem. On the other hand, outstanding examples of less sagacious military leaders are Napoleon I and Hitler in their Russian campaigns.

A forecast of atomic warfare reveals that the combat commander's mission will contain new elements derived from the vast numbers of human beings affected by the extent and the intensity of his operations when nuclear weapons are used.

Meeting such conditions demands the development and use of the most efficient CAMG organization which can be devised and in which is inherent two characteristics in atomic warfare organization. These characteristics are:

1. Balance and flexibility which recognizes the importance of the Army gaining postwar objectives and places greater reliance on air transportability.

2. Continuing need for conventional forces and means while recognizing the necessity to be prepared to cope with aggression of varying forms.

In addition to the foregoing characteristics implicit in atomic warfare organization there are three concepts which will apply on the atomic battlefield of the field army. These concepts contribute to achieving maximum combat effectiveness and have a direct relation to CAMG operations.

First Concept

In the atomic age the battlefield will be of much greater depth and width than ever before.

Because of this consideration a greater land mass and larger population concentration will come under the sphere of influence of the combat commander. As a consequence, social, economic, and political problems of a greater scope will be his concern. To avert using combat trained troops, the commander will have an in-

creasing need for personnel skilled in CAMG combat support operations.

However, manpower available for control of these lands and the populations therein will be limited. This highlights the necessity to increase our combat effectiveness through developing CAMG technological proficiency to the maximum.

With respect to the development of new CAMG techniques, the task ahead in the systematic development of the "CAMG science" is a challenge which can and will be met. The availability to our combat commanders of qualified CAMG personnel will serve to minimize the many problems inherent in this field.

Second Concept

Under atomic conditions basic combat units are small integrated battle groups of all arms, which are semi-independent, self-contained, and capable of operating over extended distances on a fluid battleground for prolonged periods with minimum control and support by higher headquarters. Extreme mobility inherent in such battle groups gives them the added capability to concentrate rapidly, attack hard, and disperse quickly.

Such tactics will call for a greater measure of self-dependence on the part of our commanders, their staffs, and their men than has been required heretofore. The demands on leadership due to dispersal and the employment of complex weapons systems will require full utilization of the capabilities of the CAMG organization to assist in the accomplishment of the mission.

Such utilization will require the use of G5 staff sections; effective deployment of CAMG units; the thorough education of officers and men in the role and capabilities of the CAMG organization; and making provision for carrying out CAMG functions in those lower echelons which are not authorized CAMG staff sections.

In this respect it is significant to note that current CAMG doctrine is adaptable to the requirements of the atomic battlefield. It is not old; it has emerged since World War II and is derived from the lessons of history. Four basic characteristics of this CAMG doctrine are:

1. CAMG units are the flexible cellular type capable of being tailored with CAMG functional specialists and CAMG officers necessary to meet the requirements of the area in which deployed.

2. CAMG units, specially trained for both overland and airborne field operations under combat conditions, are assigned or attached to armies, corps, and divisions to give CAMG support to the command.

3. In a mobile or unsettled situation, decentralization of command authority ("operational chain of command") over all CAMG units, supplementary to those providing direct support of combat, assures that the demands of dispersal can be met.

4. Aid to battle groups operating over extended areas for prolonged periods is the primary function of CAMG operations to ensure maximum utilization of the resources of the area for the support of the combat forces.

Third Concept

Staggered tactical formations of the atomic battlefield, dispersed in great depth, place heavy emphasis on reconnaissance and surveillance to cover unoccupied void areas, as well as increase the need for accurate and timely intelligence in order to reduce to a minimum all uncertainty regarding enemy actions in the unoccupied void areas.

The vital part which CAMG intelligence plays in keeping the responsible combat commander informed of the political, economic, and population effects on courses of action open to him has been recognized, and it is incorporated in Field Manual 101-5, *Staff Officers' Field Manual, Staff Organization and Procedure*, as the CAMG

estimate of the situation. The purpose is to develop a systematic procedure which will furnish the combat commander with the type of intelligence he needs regarding the people in his area. He will thereby be able to take action to preclude the economic, political, and governmental reactions of the population from erupting into threats to the security of his forces or the accomplishment of his mission.

The accent on dispersal presents critical problems in the surveillance, intelligence, and security of lightly held or unoccupied areas. For some time it has been recognized that the main factor for effectively gaining control over guerrilla forces is the restoration of public order and safety coupled with a basic economic stability.

For lightly held areas the task is primarily one of generating confidence among the population in the local government's ability and willingness to function. This is done by furnishing government services such as communications, employment, relief, and protection.

Unoccupied void areas present a more difficult problem. This problem can be overcome also by extension of local governmental influence into these areas with particular attention to extending local public safety personnel and agencies under CAMG supervision into the unoccupied void areas to act as a guerrilla and subversive force deterrent.

Meeting CAMG Requirements

Consistent with the thoughts thus far presented, following are some specific proposals for meeting the CAMG requirements of the atomic age:

1. G5 staff sections and CAMG units must be included in the combat commander's force. This has several corollaries.

a. Military personnel throughout the services must be indoctrinated in CAMG capabilities in order to provide the balanced force needed to carry out the commander's mission. In this connection all branch service schools must give greater emphasis to CAMG orientation.

b. The operational nature of CAMG activities must be reflected throughout military doctrine so that the G3-G5 relationship will be understood fully by commanders and planners.

c. CAMG plans, units, and staff sections must be included in all maneuvers and command post exercises in order that organizational and doctrinal developments may provide the combat commander of the future with a tested capability to handle his CAMG responsibilities.

d. There must be an appreciation of the need of the field commander for clearly defined national objectives and policies.

2. G5 representation should be established in all Military Assistance Advisory Groups in order to develop a capability within the armies of our allies to conduct CAMG operations. Close liaison must be maintained with governmental agencies such as the Foreign Service, the International Cooperation Administration, and the United States Intelligence Agency in order to make maximum use of techniques developed and to smooth out transition of authority problems when occupied areas pass from military to civil control.

3. Development of a viable doctrine to counteract Communist propaganda must be encouraged. Maximum use must be made of the free intellectual and religious traditions of the United States in combating communism and gaining our postwar objectives.

4. The technological proficiency of CAMG personnel must be increased by:

a. Maintaining a continuing research program in order to develop new techniques, procedures, testing criteria, and detection of new research areas.

b. Placing emphasis during CAMG training on such subjects as the role of CAMG in combat operations; development of plans, orders, and annexes; problem solving methods and techniques; cul-

tural and environmental factors affecting the relationship between our military and local governments and peoples; and procedures for allocating manpower and resources.

5. Because of the wide areas of great depth which are contemplated for atomic age warfare, the problem of preparing CAMG personnel in area characteristics and language will be magnified greatly. Consequently, area documentation must be kept current and extremely concise. The designation of areas of deployment must be made early in order that language training requirements may be met. In addition, increased emphasis must be placed upon CAMG intelligence training, including the estimate of the situation and intelligence collection planning.

6. Operational planning must give greater emphasis to refugee control in order to prevent interference with ground mobility. The local public safety organization, under CAMG supervision, should be extended throughout the unoccupied void areas as far as practicable to act as a guerrilla and subversive force deterrent.

Conclusion

The critical point of atomic warfare will hinge on the combat commander's ability to exploit the advantage gained from the use of the weapon. With the chaotic conditions envisioned, his ability to handle the multitudinous problems—technical, ideological, logistical—posed by the population among whom he is operating may mean the difference between success or failure.

. . . this is a time when the Army must be prepared instantly to react to situations requiring the use of either conventional or nuclear warfare. It is a time too when the high cost of new equipment demands the most stringent economy—economy in the use of money and in the use of people. Our active forces are being made leaner and more mobile. No American has any doubt of their capability to perform their mission. But the deployment of Army forces overseas in the future will have to be accomplished much more rapidly and perhaps with a considerably smaller percentage of supporting troops than we have used in the past. Among other requirements this points up the need for a greater CAMG capability than we have ever had. If our combat forces are to be effective, they must be assisted in the control of local populations. They must have available all the resources of the area it is possible to obtain. It is doubtful that we will be able in the future to allow ourselves the time to build up large logistical bases overseas before committing our combat forces. The use of local resources will probably be of decisive importance to us. This is especially true of human resources.

Hence as we see the impact of new devices of war on the organization of the Army, and as we devote a greater part of our national effort to technological developments, the importance of the CAMG function in national defense increases.

Assistant Secretary of the Army George H. Roderick

The Soviet Army Logistical System

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IN THE study of any military force, numbers, equipment, training, and tactical doctrine are not the only significant factors. The organization for logistical support must be considered. No force can function efficiently without the timely and adequate distribution of necessary supplies to combat units and the provision of necessary services. The purpose of this article is to examine the major facets of the logistical system of the Soviet Army and its development, with emphasis on supply within field armies. Comparisons will be made with the United States Army logistical system.

To understand fully the Soviet Army logistical system and its development, it is desirable to examine the logistical system employed by the Czarist Army. At the national level, under the Czarist system, the quartermaster general department was responsible for logistics and many other varied activities. Included among these nonlogistical activities were troop organization and training, quartering, operations, training of general staff officers, and the supervision of the Imperial Staff Academy.

The quartermaster general also was charged with the esoteric duties of instruction of officers in oriental languages and control of many matters pertaining to Siberia, the Amur province, and the Kwangtung District. Within the quartermaster general staff there was no clear distinction between supply and personnel functions. In fact, ration supply was a responsibility of the same staff section charged with supervision of voluntary enlistments.

In the Czarist field army many logistical responsibilities were vested in a chief of military communications. Among his many duties were planning lines of communication organization, rear area protection, maintenance of telegraphic services, transportation requirements, government of occupied areas, evacuation of wounded, and salvage. He delivered all supplies to forward army supply points. Theoretically subject to the field army chief of staff, the chief of military communications was not part of the field army general staff. This distinct separation of many major logistical functions from the general staff, and in a subordinate status at that, resulted in inadequate coordination of logistics and operations.

At corps and division levels there were no agencies comparable to the field army chief of military communications. Lack of such logistical agencies in major subordinate commands can be attributed, in part, to the centralization of logistical control at the field army level. Staff organization below field army also was less specialized, not uniform, and not clearly defined. The chiefs of staff of subordinate units performed many of the duties pertaining to logistics usually accomplished in other armies by an assistant. Consequently, logis-

The Soviets have developed an effective and flexible system of logistical support geared to their operational requirements. Although differing from US concept, both may prove equally effective in atomic warfare

tical planning frequently was neglected.

The subordinate status of logistical planning and its lack of close coordination with operational planning helped contribute to the Czarist defeat in the Russo-Japanese War of 1904-05. Already limited by dependence on the tenuous Trans-Siberian railway, the Russian forces were handicapped severely by inadequate supply and maintenance. The obvious failures in the staff system demonstrated during that conflict were not corrected. Even during the last large-scale maneuvers prior to World War I, the Kiev maneuvers of 1914, little or no attention was paid to the problems of logistical support.

With the outbreak of World War I the same deficiencies appeared. As early as the winter of 1914-15, frontline units were handicapped by lack of supplies, particularly artillery ammunition. Poor logistical planning is illustrated by the fact that field ordnance repair facilities for small arms were neither foreseen nor provided.

The Czarist Army did have a few capable officers who were cognizant of these deficiencies. One such officer, General Nicholas Golovine, contributed largely to the successful Russian offensive of 1916 which resulted in breaking the Austrian front in Galicia. This success, made possible by efficient staff work with adequate logistics, was the exception and not the rule.

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Failure of the logistical system hastened the disintegration of the Imperial Russian Army. Defeat at the front, coupled with the rising revolutionary fervor at home, brought an end to the Romanov dynasty. The liberal government of Alexander Kerensky, unable to maintain itself in power, gave way to rule by the Communists led by Lenin and Trotsky.

Soviet System Before World War II

The concerted Communist effort to root out all vestiges of the Czarist military system never fully succeeded because of existing circumstances. Large numbers of former Czarist officers joined the Communist ranks or were impressed. The Communists very early had become aware of the need for trained officers to help defeat the counterrevolutionary armies. These former Czarist officers carried over the old Imperial staff system to the new Red Army.

Some former general staff officers joined the Reds and rose to positions of great influence. Colonel S. Kamenev joined the Communists early and by 1919 was Commander in Chief of all the Soviet Armed Forces. Major General Svechin became Chief of the Red Army General Staff. Boris Shaposhnikov rose to be Chief of the Red Army General Staff and a confidant of Stalin in the early days of World War II. The Communists had no staff theory or methods to substitute for the established doctrine of the old Imperial Army. As a result, the logistical organization of the Czarist Army was retained initially by the Red Army.

As the Soviet Union industrialized and created mechanized forces, changes and realignments in the logistical system were made. The system that evolved by the time of the outbreak of World War II was marked by a great degree of decentralization and the characteristic Russian weakness of inadequate unity between operational and logistical planning.

There were different chains of command for the supply of ammunition, weapons, special equipment, and other classes of supply. Logistical organizations at the various levels of command differed. Responsibility for transportation was divided. The chiefs for the arms and services dealt directly with the commander of the unit and not through the chief of staff who supervised the operational planning of the unit. Lack of centralized responsibility for transportation and lack of coordination between operational and logistical planning became apparent in the first few weeks of World War II. Some of the initial spectacular successes of the German Army were due in part to the collapse of the Soviet Army logistical system. This time, however, the Soviets took prompt corrective action.

Current Soviet System

Order Number 0257, of 1 August 1941, centralized control of procurement and transportation of supplies and created the position of chief of rear services at the national level. The chief of rear services was made responsible for the procurement of all supplies except ammunition, weapons, and technical service equipment. He was responsible, however, for the transportation of all supplies.

Order Number 0379, dated 12 June 1943, consolidated all existing orders concerning logistical organization. This order is of interest because it indicated that by this time the chief of rear services concept had been extended to all levels of command down to include regiments. Changes resulting from late World War II experiences and postwar reorganiza-

FIGURE 1.

tions have only been minor in nature. The advent of atomic weapons has not caused any material changes in the logistical organization although some techniques have been modified. The major modifications in techniques have been greater mechanization in the handling of supplies, greater use of pipelines for forward delivery of bulk POL products, more mobile service installations, and smaller and more dispersed logistical installations.

The current organization of rear services at the national level is illustrated in Figure 1.

At this level the chief of rear services supervises directly those agencies responsible for the procurement, storage, and distribution of supplies and equipment that are common to the ground, naval, and air forces. These supplies include common use categories such as rations, POL, quartermaster type supplies, veterinary and medical supplies—all noncombat type supplies. The supply of combat type items such as weapons, ammunition, and other technical equipment is not a direct function of the chief of rear services but rather of the chiefs of the technical services. However, the chief of rear services is charged with coordinating their efforts. It can be said that a United States counterpart would embody, at the Department of Defense level, the duties of a technical service chief and the coordinating authority comparable to that exercised by the US Army Deputy Chief of Staff for Logistics.

At the Soviet front, comparable to the US Army group, and the field army levels, the former chief of military communications has become a chief of rear services. This time, however, he has a counterpart at all subordinate echelons down to and including the regiment. At all field command levels the rear services organization supplies a substantial part of the logistical needs of the unit (excluding combat supply items), virtually all of the transportation for movement of all supplies, and coordinates all logistical matters. The chief of rear services also directs all the activities in the unit rear. Included are such activities as traffic control, handling of replacement personnel, rear area security and area damage control, communications, and control of civilians. Civil affairs and military government in occupied areas also is under the jurisdiction of the chief of rear services at the front and army levels.

Control of traffic is particularly significant. At field army and higher levels it also includes the rail transportation facilities in the area. The actual operation of the railroads usually is in the hands of militarized civilians. The chief of rear services directly controls all the noncombat transportation of the unit. In critical situations the commander may authorize him to levy on subordinate units for additional transportation resources. The chiefs of the technical arms and services at all levels coordinate their logistical activities with the unit chief of rear services and adapt their plans to fit into his over-all plan. The unit chief of rear services designates the locations of the supply and maintenance installations of the technical service chiefs and furnishes them the transportation necessary to move their supplies. In United States Army terms, the chief of rear services at a tactical unit level is not only the G4 of the unit, but also the rear area commander, the trains commander, and the commander of a unit support command.

Because of his dual responsibility for logistical planning and execution, the Soviets have made the chief of rear services a deputy commander in the command. He usually is ranked only by the commander and the unit chief of staff. This command position is eloquent testimony to the importance the Soviets now attribute to logistical matters. Being responsible for logistical planning, the chief of rear services participates in the planning of all opera-

tions. He, in turn, has a staff known as the organization and planning section to assist in the logistical planning. The chiefs of the technical services also assist in the logistical planning. When the logistical plans are approved by the commander, the chief of rear services supervises the execution of the plan. With logistics under the control of a deputy commander, the unit commander and chief of staff are more free to devote the major part of their attention to operational matters.

At the field army and front levels the chief of rear services directly controls all logistical functions except those which are the responsibility of the deputy for construction and billeting at *front* level and of the chiefs or commanders of the technical arms and services such as artillery, tank and mechanized, engineer, chemical, and signal troops. Each of these arms and services has supply and service responsibilities and, at these levels, operates supply and service installations. However, the coordination of their logistical functions and control of all nontactical transportation is the responsibility of the chief of rear services who also prepared the over-all logistical plan. Supervision of the technical operations of the supply and service activities of the technical services is accomplished by the chief of the technical service at the next higher echelon excluding the corps level. Chemical, signal, and engineer combat support operations at all echelons are not under the control of the chief of rear services.

In many respects this organization is not too dissimilar to the current US Army system. Under both systems, at field army level, the chiefs of the technical services supply and maintain the equipment peculiar to their service under the supervision of the logistical officer who prepared the logistical plan. The logistical officer ensures that the over-all activities of the technical services are in conformance with the logistical plan supporting the operation. Under the Soviet system, however, the logistical officer also directly controls most common noncombat type supplies and the transportation to move all supplies. Under the Soviet system, too, some of the combat arms are responsible for the supply and maintenance of their own major items of equipment.

The Soviet front, unlike the US army group, is definitely part of the logistical chain. The front logistical responsibilities in many respects parallel those of the US Army communications zone. Having conducted operations only in areas contiguous to the homeland there has been no requirement for the Soviets to develop a communications zone type organization.

The Soviet corps is a tactical formation with no rear area or logistical facilities of any magnitude. It does have a chief of rear services who is responsible for provision of logistical support for nondivisional corps units. He also exercises administrative control to ensure that the logistical support of the divisions of the corps is in accord with the tactical plans of the corps commander. There are virtually no differences between the broad functions of a US army corps G4 and his Soviet counterpart.

At division and regimental levels the supply and maintenance of all items, excluding technical service equipment, ammunition, and small arms, normally is the responsibility of the unit chief of rear service. The supply of ammunition and the supply and maintenance of all weapons, except tanks and assault guns, is the responsibility of the unit artillery commander. This is true at all echelons of command except the corps. In effect, the Soviet artillery is a supply agency as well as a supporting combat arm. Above corps level the supply and maintenance of tanks and assault guns are the responsibilities of the commander of armored troops. The transportation for the movement of all weapons and ammunition, however, is con-

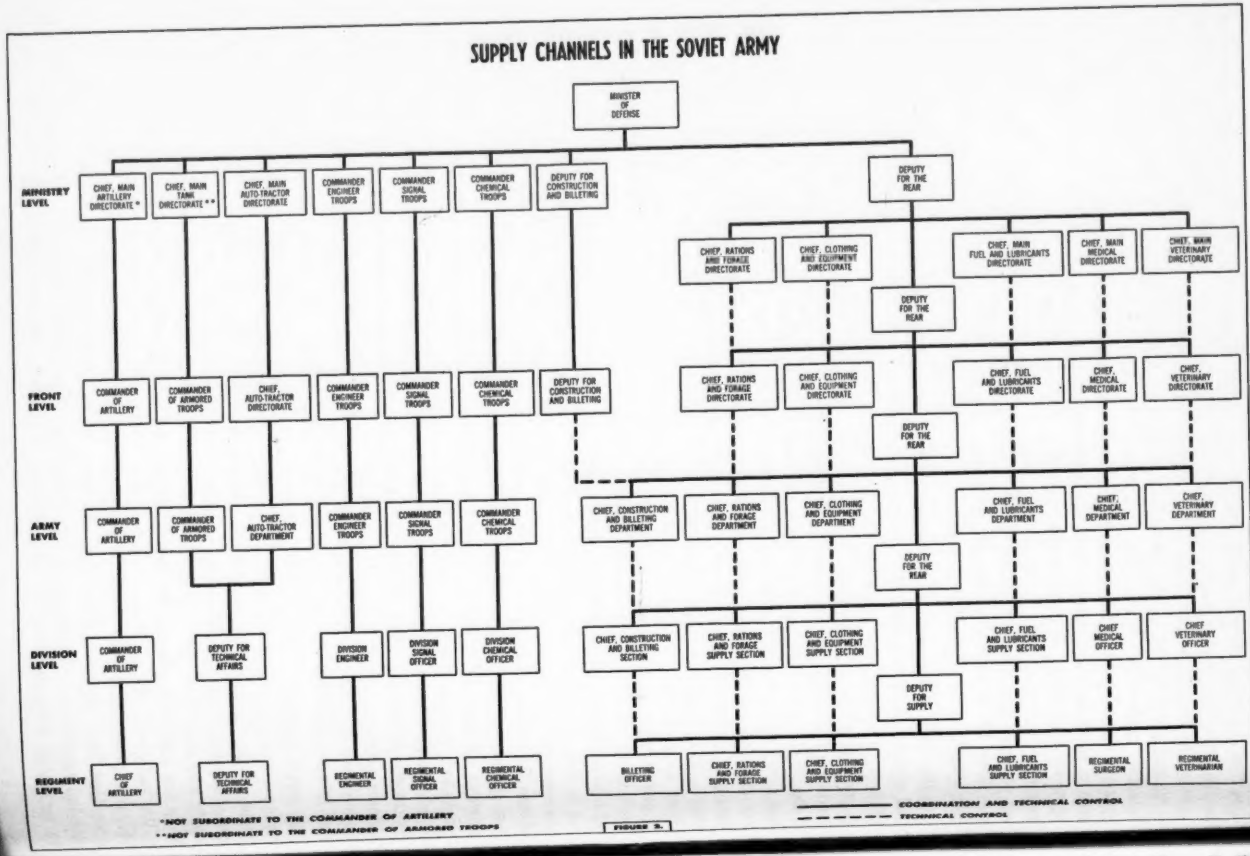

FIGURE 2.

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trolled and provided by the unit chief of rear services.

Within the division—except for technical supplies, weapons, and ammunition—subordinate units look to the division chief of rear services for all supply and for evacuation and service beyond their organic capabilities. The division chief of rear services secures the supply of common noncombat items directly from the chief of rear services at army. The supply and maintenance of technical service items are secured by the appropriate technical service from their counterpart at army. Army secures supplies and services in a similar manner from the chiefs of rear services, technical services, and deputy for construction and billeting at the front. As indicated earlier, the corps is not normally a part of the supply chain proper, except for the provision of logistical support of nondivisional corps troops, and for recommendations to army on allocation of critical supplies and priority of maintenance and evacuation. (See Figure 2.)

In the wartime operation of this logistical system, the Soviets displayed great flexibility and resourcefulness. Local resources were exploited to the maximum to relieve strains on national economy and on the available transportation system. Essential combat supplies, such as POL and ammunition, were accorded the highest priorities. Supply procedures were modified ruthlessly, where necessary, to ensure accomplishment of these priorities. While success in one operation often was achieved at the expense of future operations in the same sector, Soviet rear service activities were governed by sound principles and procedures.

During World War II the Soviets generally practiced unit supply—the field army delivering supplies to the divisions and divisions to their subordinate units. This procedure was due primarily to circumstances rather than free choice. Tremendous losses of equipment, including vehicles, during the early phases of World War II forced the Soviets to maintain highly centralized control to ensure maximum use of available resources. This shortage of vehicles, coupled with the relative lack of roads within the USSR, also resulted in greater reliance on rail transportation within the combat zone than is found in most modern armies. In the last phases of World War II, and in postwar reorganizations, the Soviets have increased the number of organic trucks within combat divisions. This was part of the apparent Soviet goal to achieve flexibility in operations by providing major combat units with an organic capability for supply point distribution—divisions drawing supplies from forward army supply points with organic transportation. Nevertheless, unit supply still was the normal practice.

Although recent Soviet literature indicated a growing trend toward supply point distribution by certain units, this trend was criticized as being wasteful and inefficient compared to centralized control of general purpose transportation. In wartime the basic principle of unit supply would be strictly enforced when feasible. The recent increases in motorization, particularly in division supply units, indicate that the Soviets plan to make their divisions capable of supplying themselves when necessary.

US Army Logistical Systems

The logistical system in use in the US Army at the end of World War II differed from the Soviet system in a number of major respects. Under the US system the combat arms, such as artillery and armor, had no logistical functions. Under the Soviet system the functions of the United States technical services were divided between the chief of rear services and the chiefs of the various technical services and combat arms.

Generally, under both the US and Soviet systems, supply and maintenance were not the responsibilities of the individual

arms or services at regimental level. This was also true at division level for the Soviets, but not for the US system. Under the US system supply and maintenance for all divisions were the functions of the technical services. At the field army level, under both systems, supply and maintenance were the direct responsibilities of the technical services. However, the Soviet chief of rear services controlled many of the functions which under the US system were the responsibility of the quartermaster, ordnance, and transportation services.

In the distribution system, the Soviets, because of circumstances, employed unit supply while the US forces employed supply point distribution unless required otherwise by the tactical situation.

The major difference between the two systems was the *control* of supply, maintenance, and rear area functions. The Soviet system already has been covered. Under the US system, a G4, the logistics officer, on the general staff planned the logistical support of the operation and supervised the execution of the logistical plan. However, in theory he did not command any of the logistical services. The G4 was supposed to be a planner and coordinator but not an operator. The technical service officers worked directly for the commander and had direct access to him. In reality, however, the G4's supervision of technical services operations was tantamount to command. Except within the armored division, direct operational responsibility for rear area defense and area damage control was not definitely fixed. The armored division had a trains commander who was responsible for the movement and tactical control of the trains which consisted primarily of the supply and maintenance facilities of the technical services. The G4 retained supervision of the technical service operations. The relation of trains commander, the G4, and the technical service chiefs was rather tenuous. The trains commander was a full colonel while the G4 and the technical service chiefs were all lieutenant colonels. Further, the technical service chiefs had, in effect, two supervisors. By comparison it can be said that the armored division split three ways the responsibilities of a Soviet divisional chief of rear services.

Since the end of World War II the United States Army has experimented with various systems to improve and simplify logistical control. The advent of atomic warfare with its emphasis on self-contained forces capable of rapid dispersion and concentration added impetus to the experimentation. The first major experiment culminated in the Atomic Type Field Army (ATFA).

Under the ATFA concept all logistical support, with a few relatively minor exceptions, was vested in a support command at division level and a support brigade at the field army level. The army level support brigade contained subordinate support commands which furnished the logistical support for each corps. Within the support brigade and support commands, supply and maintenance were on a functional basis, with a few exceptions as previously mentioned, regardless of traditional technical service responsibility. The support commanders had command responsibility of all rear area functions such as defense and area damage control for the supported unit. However, the planning of logistical support was still the responsibility of the G4 who usually was junior in rank to the support command commander who executed the plan. In effect, the support commands were major additional subordinate units of the command.

The ATFA concept was essentially the extension of the Soviet chief of rear services system to an extreme degree. In reality, the support command commanders were superchiefs of rear services without broad planning functions. ATFA also set up another echelon of supply and mainte-

nance between division and army. This echelon is completely lacking in both the Soviet and the standard US logistical organizations. ATFA also carried the combined supply and maintenance organization to the army level.

Extensive field maneuvers and command post exercises brought out clearly that the ATFA concept in its entirety was not practicable. The merging of all technical service supply and maintenance responsibilities into a functional basis through the field army level proved too cumbersome and too complex to be manageable. The interposition of a new echelon at the corps level made the ATFA logistical system less responsive to operational requirements than the system it was meant to improve. At the division level the combined supply and maintenance organization showed some promise.

The latest changes in the US Army logistical system are reflected in the reorganized airborne, infantry, and armored divisions. Within the field army, above the division echelon, there are no significant changes to the system in effect at the end of World War II.

Within the airborne, infantry, and armored divisions there is no uniformity. The World War II system of technical service responsibility is continued within the infantry and armored divisions, but a different system is being tried in the airborne division. The airborne division supply and maintenance are on a functional basis under a support command commander as in the ATFA concept. The airborne division logistical system, in many respects, approaches the Soviet divisional logistical organization. However, the airborne division G4 still is retained as a planner and coordinator while the commander of the support command is responsible for the execution of the logistical plan. Of interest is the adoption by the infantry division of the trains commander concept. Organic transportation is reduced to the minimum within all three types of the new divisions. As a result, except for the supply of ammunition and POL, the divisions are no longer capable of supply point distribution with organic transportation. This represents a radical departure from the past when all divisions had adequate organic transportation for supply point distribution.

Summary

It is apparent that the objective in the US Army logistical system experimentation is to determine the optimum degree of functionalization and control and the level at which it can best be achieved. The Soviets have found that the solution, from their viewpoint, is to combine the planning and over-all control of logistics at all levels and to combine supply and maintenance, except for technical service items, ammunition, and small arms, at the division level. The US Army logistical system and experiments in new logistical organization have consistently rejected combining the logistical planning and over-all logistical control.

The US concept of centralized transportation for logistical operations tends to parallel Soviet logistical doctrine. However, the stripping of supply transport from US divisions represents a complete departure from current Soviet trends. The Soviets have been increasing organic division transportation since the last phases of World War II. While recognizing the economy of pooling transportation, it appears that the Soviets may be dubious of the capability, under conditions of modern warfare, of the higher echelons habitually to deliver supplies and make additional transportation available to subordinate units at will. Perhaps, too, the experiences of supporting fast-moving fluid operations during the latter phases of World War II with centralized control of transportation at higher echelons may have convinced the Soviets of the desirability of giving their

divisions an organic capability for supply point distribution.

The Soviets apparently are striving for the dual goal of economy of pooled transportation and the flexibility made possible by increased supply transport at division level. The recent increases in motorization of all Soviet units have resulted in making tank and mechanized divisions *fully* capable of employing supply point distribution. While the increase in supply transport of the rifle division has been great, the capability of the rifle division to employ supply point distribution is still limited.

From the roots of the loose Czarist system of logistical support the Soviets have developed an effective and flexible system of logistical support that is geared to operational requirements. Apparently the Soviets believe that their system, tempered in the caldron of World War II, will withstand the trials of atomic warfare. The system employed by the US Army in World War II achieved magnificent results. However, US Army experiments are designed to improve the system further in order to permit it to perform as well under new conditions. While the two systems contain marked similarities and dissimilarities, they both may prove equally effective.

The Army must ensure that its forces are fully prepared and equipped to fight a war, with or without nuclear weapons, anywhere in the world. To retain a constant state of readiness, and concurrently to modernize Army forces as quickly as possible within budgetary means, new material must be phased into the Army's supply system, and the old must be phased out over a period of years.

* * * * * * *

The Army has made a concerted effort over the last two years to modernize its logistical system and the management thereof. . . . Unlike the military forces of the nations of the Communist bloc, the United States Army maintains its strength along distant exterior lines. For this reason its logistical base is large, but continuing effort is being applied to make it increasingly efficient.

General Maxwell D. Taylor

PENTOMIC INFANTRY DIVISION IN COMBAT

Major John H. Cushman, *Infantry*
Faculty, U. S. Army Command and General Staff College

REDUCE the strength of the triangular infantry division by 3,700 without losing a man in rifle platoon strength. Establish five battle groups, eliminate the infantry battalion, and strengthen the rifle company. Include a cavalry squadron (formerly reconnaissance battalion), and organize its armor (tank) battalion into five tank companies. Decrease the number of artillery tubes, but add atomic delivery means. Assign pooled armored personnel carriers and reorganize the engineers, aviation, communications, and administration. Require that the division be capable of fighting both an atomic war and a "conventional" war under the threat of atomics in any corner of the world.

That is the "Pentomic" Infantry Division. It is a flexible instrument for national security, organized to meet its responsibilities in the diverse conditions of the era of atomic plenty.

The doctrine for the Pentomic Division has been evolving the last few years, as each of the new features of the division has been studied and tested. This doctrine is related closely to the roles in which the division may be expected to operate, and to the *operational environments* existing in potential combat areas.

Operational Environments

The operational environment will vary with the type of war in which it is engaged which may vary from a general atomic war to limited war of a local or "brush fire" type.

Although the deliberate initiation of general atomic war appears less likely with passing time, the infantry division must be prepared to fight in such a war and win.

A local war probably would be confined to limited forces and a limited area. A local war probably would be fought under moderating influences applicable to both sides, although these may be removed suddenly and without warning. If a local war involved the use of atomic weapons, this might be with certain restrictions as to the size of the weapon and the location and type of target.

The strategic mobility of the infantry division, its ability to apply measured force, its versatility, and its suitability to a variety of operational environments make it invaluable in both general and local war and a cornerstone of the national military structure.

Scale of Atomic Warfare

A particular problem of environment is the scale of atomic warfare. This may involve a wide range of conditions, depending upon the number and yields of weapons being employed. If large numbers of weapons of all yields are employed, then a pattern of operations is allowable

The Pentomic Infantry Division has been organized and equipped to take maximum advantage of the flexibility and mobility required to meet responsibilities in the diverse conditions of this atomic warfare era

in which fire may be dominant over maneuver. When small-yield weapons are employed at infrequent intervals, combat will be similar to operations without atomic weapons, and maneuver becomes a more controlling element in the maneuver/fire equation.

In atomic warfare the commander must continually evaluate the scale of the use of atomic weapons and determine the risks involved and the allowable pattern of his operations. He is not uninformed in this matter; battle experience and intelligence information available to him will simplify this task.

Similarly, the tactics and techniques of the division will vary with the geographical area, with the force structure, and with the nature of the enemy.

The wide variation in operational environments makes it even more evident that no doctrine can be interpreted as the last word, applicable under all conditions. There is no set of rules of employment which can be used to ensure success on the battlefield. In 1934 George C. Marshall, then colonel of infantry, wrote these words in the military classic *Infantry in Battle.*

The art of war has no traffic with rules. . . . Every situation encountered in war is likely to be exceptional. The schematic solution will seldom fit. . . . It is more valuable to be able to analyze one battle situation correctly, recognize its decisive elements, and devise a simple workable solution for it, than to memorize all the erudition ever written of war.

Without describing the division organization in detail, some of the more important implications on doctrine of the new structure are worthy of study.

Mobility

Strategic air mobility is a prime objective of the Army, and in the Pentomic Infantry Division powerful weaponry is concentrated into small and lightweight groupings to achieve this aim. With the exception of its tanks, the combat equipment of the division is transportable in long-range (*C-124*) aircraft.

True tactical mobility is achieved by exploiting the means appropriate to the situation—under some situations the ability to move over difficult terrain on foot faster than the enemy may be decisive. The spectrum of tactical mobility of the division includes far more than foot mobility, however. Trucks, armored personnel carriers, a limited number of aircraft organic to the division, and means available from higher headquarters can be shifted from unit to unit to provide the mobility appropriate to the situation.

Organic armored personnel carriers present problems in training the infantry battle groups which must be able to use these carriers as armored infantry and in reinforced tank-infantry teams, as well as merely transportation to assembly areas from which the infantry will fight on foot.

Versatile, flexible, adaptable mobility is a built-in feature in the structure of the Pentomic Division and the approach to its doctrine and its training.

The flexibility of the division also comes from the organization by "fives," and from the ability to use tanks, engineers, and artillery to reinforce the battle groups. It is the product of a flexible system of administrative support and control. Above all, it relies on flexibility of mind throughout the chain of command.

Combat Power

The basic "building block" of the division is the infantry battle group with its four rifle companies, mortar battery, and headquarters and service company. The rifle company contains most of the weapons of the former battalion, including 81-mm mortars and 106-mm recoilless rifles. The battle group is a self-contained unit, consisting of the support elements formerly

found in the regimental combat team (RCT).

To view the new battle group as a "reinforced battalion" is inaccurate, and risks a failure to exploit the power and capabilities built into a unit which in foxhole strength equals that of two battalions of the triangular division.

The armor battalion of five tank companies, and the cavalry squadron with three troops, together with the five battle groups, comprise the total of seven maneuver elements which can be directly under division control. The doctrine for the armor battalion and the cavalry squadron includes attachment of companies or troops to battle groups, or operation as a unit, depending on the situation.

Although the division artillery is organized into a 105-mm howitzer battalion of five firing batteries, and a composite battalion with two 155-mm howitzer batteries, one 8-inch howitzer battery, and an *Honest John* battery, the organization for combat may result in two composite battalions. For example, an attack on a wide front might result in one battalion controlling three 105-mm howitzer batteries, one 155-mm howitzer battery, and the 8-inch howitzer battery, with the other battalion controlling the remaining firing batteries of division artillery. However, the division artillery commander may reinforce the fires of the mortar battery organic to the battle group by placing one or more of the 105-mm batteries in direct support of the battle group. The *Honest John* battery is the division organic atomic weapon delivery means.

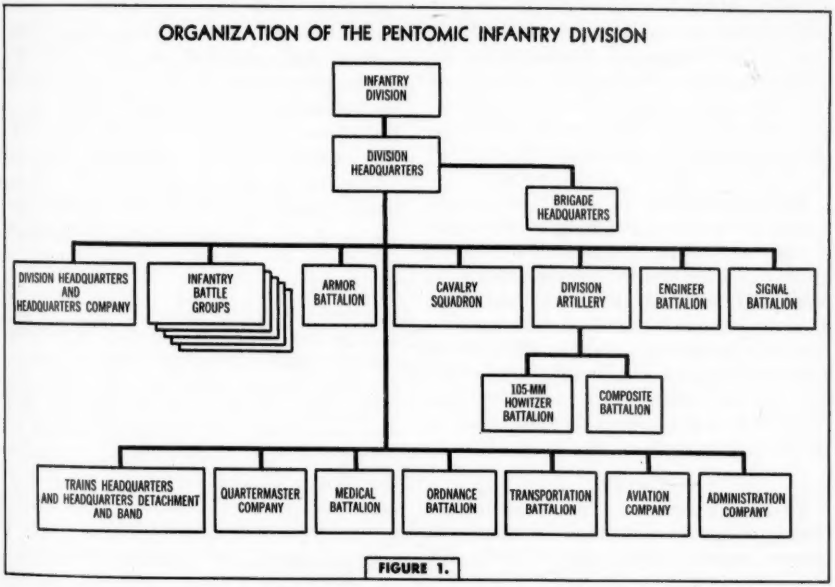

FIGURE 1.

An important difference in the new artillery organization is the direct support mission for the battle group performed by the organic mortar battery, which is equipped with forward observers, a liaison officer for the battle group commander, an air control team, and communications to tie in directly with division artillery.

The division engineer battalion has five

line companies to fit the pentagonal structure. The engineers may operate with battle groups in a general support, direct support, or attached role depending on the situation.

The aviation company contains all the aircraft of the division. Although the aviation company is assigned to the division trains in order to centralize its maintenance and administration, it operates closely with the combat elements of the division. Aircraft earmarked for division artillery are provided by an artillery section of the company. A special target acquisition section is designed to work closely with the cavalry squadron in the performance of aerial battlefield surveillance missions. Eight utility helicopters are assigned for limited troop lift and air supply.

The combat power of the division is sustained by a division trains organization similar in concept to that of the armored division, with a trains commander who is responsible for only the tactical activities of the trains units. He is not responsible for their logistical activities although he facilitates these activities by coordination. The detailed doctrine of administrative support is also covered in this issue of the MILITARY REVIEW (see page 31).

Control

The direct control of five to seven maneuver elements and their combat and service support drastically changes the nature of the division commander's job. The relatively detached view he may once have been able to take is no longer possible. With only one commander between himself and the rifle company, and a combat environment that permits rapid and vital changes in the situation, the division commander must keep closely abreast of operations in the forward areas and must develop command and staff procedures that accelerate the flow of information and reduce reaction time.

The assistant division commander, with a small staff, makes it possible for the division commander to reduce his span of control by the formation of a brigade type task force of two or more battle groups. The assistant division commander also operates the alternate command post and remains abreast of the division situation to facilitate his assumption of command in the event the division command post is destroyed.

Command post arrangements are adaptable to any situation. Excellent communications permit the commander to operate for long periods from the main command post, with occasional visits forward, and they permit the establishment forward of a small tactical command post from which the division commander with a small staff may exercise more personal control over a critical part of the operation.

Streamlined staff procedures are required to ensure timely and complete integration of tactical operations, particularly the integration of maneuver elements and atomic fires. This can be achieved by establishing a command facility at the main command post organized as shown in Figure 2. G2, G3, and the FSCC (Fire Support Coordination Center) are represented under the direction of the division commander or his representative. Tactical information is received, the necessary coordination is effected, decisions are made, and orders and information transmitted rapidly to division elements. This agency

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is always capable of handling atomic fires, and should be in continuous operation whenever the division is in contact with the enemy.

The communications of the Pentomic Division are flexibly organized on the concept of the area communications system which supplements the radios organic to division elements. The system consists of a lattice of signal and switching centers located throughout the division area to provide long lines, and wire and radio-relay service to all elements of the division. Each battle group has a signal center operated by the signal battalion. The resulting system provides flexibility of signal service and allows uninterrupted service through rerouting, even though one or more signal centers may be destroyed.

Offensive Operations

No general statement of offensive doctrine can satisfy all the various possible conditions of the battle area. The tempo and patterns of offensive operations of the infantry division depend not only on the elements of the operational environment (scale of atomic warfare, locale, friendly force structure, and nature of the enemy) but also on the mobility of the division. With its organic mobility means the division can move mounted in two shuttles, can engage in combat with a variety of combinations of mobility for its maneuvering units, and can fight sustained action at a pace greater than that of the foot soldier. If additional tanks and armored personnel carriers are provided, the division will operate along the lines of

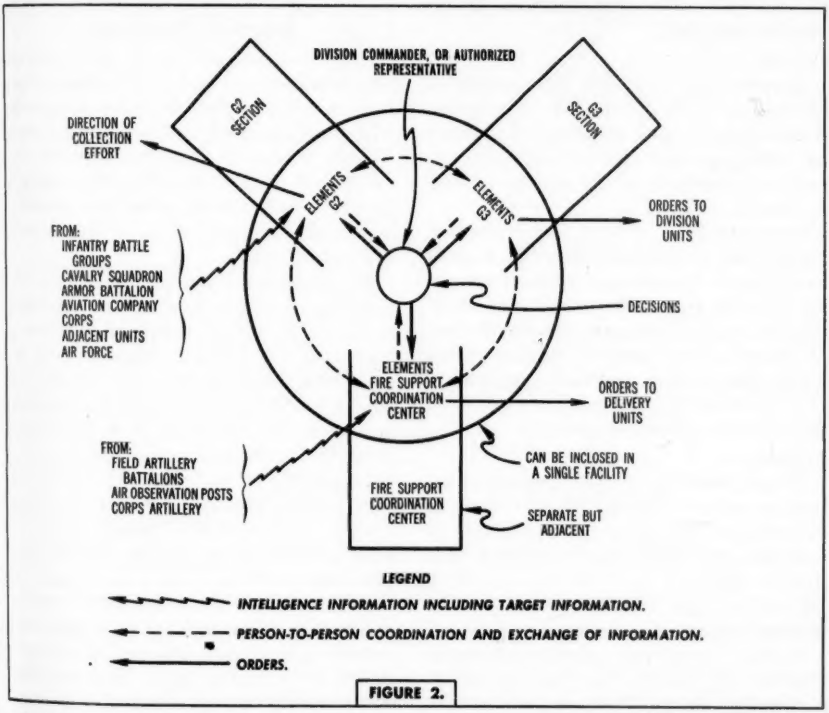


FIGURE 2.

the armored division in offensive combat. When operating with less than organic vehicles—as it may after a strategic air move—it may depend largely on foot mobility, and operations will be at a reduced tempo.

Offensive doctrine for the division emphasizes speed, violence, and striking power. A sample of doctrinal statements pertaining to offensive operations of this division includes:

Terrain:

Organic aircraft reduce the importance of securing high ground for observation. Atomic fires may be employed to neutralize enemy ground observation from terrain not required in the scheme of maneuver.

Obstacles have greater importance in atomic than in nonatomic warfare. A small enemy force defending an obstacle can delay friendly attack forces and may cause them to mass. This may require the use of atomic fires against targets which would otherwise be considered unremunerative, in order to ensure rapid traverse of the obstacle without massing.

Formations:

Atomic fires may permit multiple penetrations which force the enemy to fight in two or more directions simultaneously to meet the converging efforts of the attack. Atomic weapons may permit launching exploitation type operations from the line of departure.

Availability of large numbers of atomic weapons may permit the secondary attack to approach the effort of the main attack, and result in the operation assuming the characteristics of an exploitation by the entire force without resort to secondary attacks to fix and deceive the enemy.

Reserves:

Atomic weapons in reserve provide considerable combat power which to some extent offsets the requirement for a large reserve of troops. Atomic firepower permits a lesser degree of reliance on the troop reserve to provide flexibility than would otherwise be required.

The flexibility of the reserve allows its piecemeal commitment by the commander in the strength and at the time and place required by the situation.

Figures 3 and 4 indicate only two of the many possible patterns of offensive operations that may be employed.

Defensive Operations

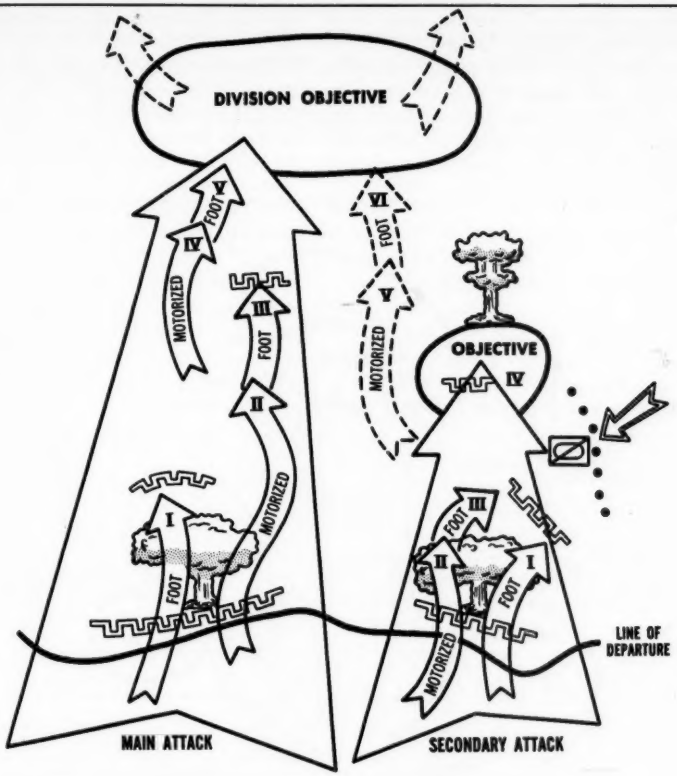
Defensive doctrine is the most susceptible to schematics and to impassioned tactical discussion. Two or three tacticians, with only a scratch pad and a pencil, can engage themselves for hours in an exchange of ideas on defensive concepts which, as it has been somewhat cynically expressed, "is exceeded in its length only by its futility."

The defense, which implies enemy superiority, becomes one of the knottiest problems of atomic war, and requires a high order of tactical judgment and ingenuity to be successful. The problem of how to use the terrain and forces available in atomic warfare so as to maximize our strengths to the enemy's disadvantage is not solved by printed material—it must be done on the ground. The least workable form of defense is the "verbal" defense.

It is important to realize what division units can and cannot do. For example, infantry on foot is strongest when it is dug in and tied in with fires. It is more vulnerable to fire and to armored attack when on the move in the open. When provided with mobility means, it can fight a delaying action against mobile forces; in strong terrain foot mobility may be sufficient. The task of the tactician is to recognize his strengths and to turn these against the enemy's weaknesses.

A sampling of doctrinal statements pertaining to defensive operations of the infantry division is as follows:

The airborne threats, partisan and guerrilla action, existence of wide gaps in



ROMAN NUMERALS INDICATE A PROBABLE SEQUENCE OF ACTION FOR EACH ATTACK.

FIGURE 3.

Continuous movement of forces to division objective, maintaining the momentum of the attack at all times.

Attacking units are on foot or mechanized, reserve units are motorized or mechanized with available transportation. Throughout the advance, attacking elements heavily engaged are rapidly bypassed by motorized or mechanized reserve units, or reinforced by this reserve and/or by atomic fires. Momentum and mutual support are provided by the rapid phasing of motorized units into the attack.

dispersed formations all result in modern wars in a defense which is multidirectional more often than unidirectional. The flexibility of the organization by fives and the armor battalion and cavalry squadron facilitate defense in more than one direction.

Atomic warfare emphasizes the organization of defensive localities in depth, to prevent the enemy from rapid exploitation after breaching forward positions.

The increased reconnaissance means available to the division (cavalry squadron, reconnaissance platoons in each bat-

tle group, increased aircraft, and their battle area surveillance capability) permit longer range reconnaissance and provide for the screening of greater gaps between organized defensive localities.

Although it may be said that there are two basic types of defense—the position defense and the mobile defense—"pure" concepts such as these are rarely found on the battlefield. The defense adopted usually is a mixture of the defined types which lie at opposite ends of a scale with a wide range of variations between. This can be illustrated in a diagram such as shown in Figure 5.

The Pentomic Division can conduct all types of defensive operations, although it is more suited by its organic means to perform the position defense than the mobile defense. When reinforced with transportation and additional combat power it can conduct a mobile defense effectively.

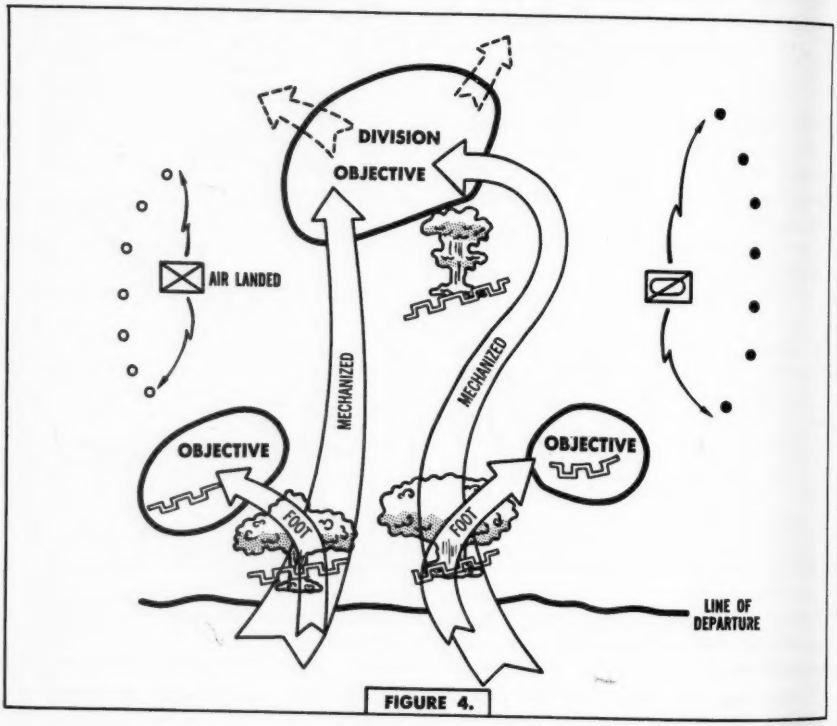


FIGURE 4.

Rapid exploitation of atomic fires by mechanized elements of the division to seize the objective.

May require reinforcement by armored personnel carriers. Operation is characterized by surprise, speed, violence, shock action, and mobility and flexibility of attacking echelons.

Mobile Defense

In a mobile defense minimum necessary forces occupy forward defensive positions with the large element of the division re-

tained as a striking force (Figure 6). Forward defensive positions, strong points, and observation posts warn of impending attack, canalize the enemy into terrain favorable for the defender, and block or impede the attacking force. Principal reliance is placed on bold and vigorous counterattack by the striking force to destroy the enemy in the selected tactical locality most favorable to the defender.

Two new terms can be noted in Figure 6. The reconnaissance and security line (RSL) is manned by reconnaissance and security forces. Because of the more extended and multidirectional nature of the defense, these are used frequently in place of a general outpost when the area of security responsibility is large, or when it is desired to economize on security forces.

The forward edge of the battle area (FEBA) more accurately describes the concept of defensive organization in depth than did the term "main line of resistance."

Position Defense

The position defense is characterized by a strongly held battle area (Figure 7). The battle area consists of frontline battle groups, including the holding garrisons and reserves. Reliance is placed on forces in organized localities to maintain positions and control terrain between positions, by obstacles, screening forces, patrols, and direct or indirect fires (including atomic). Units may be dispersed in assembly areas adjacent to critical terrain, prepared to occupy it, or to call for atomic fires on it, if seized by the enemy.

Figure 7 shows a position defense on an extended frontage, a defensive variation which will frequently be adopted under both atomic and nonatomic conditions. It is characterized by depth in the position, a strong reserve, and strong firepower forward. Aggressive reconnaissance and planned fires are essential for the control of the gaps between defensive localities.

Retrograde Operations

In fluid atomic warfare the division as a whole, or parts of the division, often will deliberately conduct retrograde operations to deceive and draw in the enemy in order to position him up for destruction by atomic weapons and counterattack.

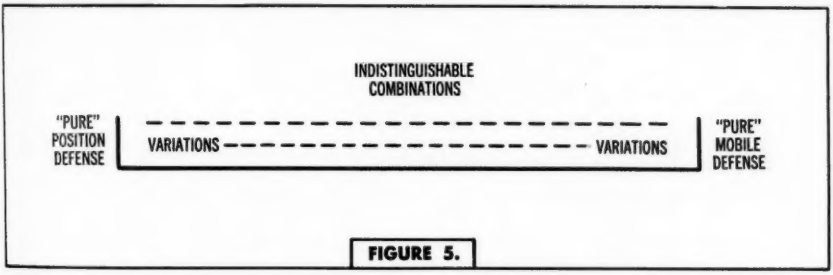


FIGURE 5.

A well-conceived and well-executed retrograde operation can be used to weaken the enemy progressively and thereby permit decisive offensive operations. The exercise of positive control in planned operations by the division and subordinate commanders will reduce the possibility of demoralization and panic, one of the most dangerous elements of a retrograde situation.

The flexibility of the division and the variety of means available allows wide variation in the pattern of a retrograde operation and in the composition of forces on and between successive positions.

Continuous delay between positions is

more common in the Pentomic Division. The mobility of the division and the more powerful weapons at each echelon permit the establishment of small task forces which can delay stubbornly and continuously between positions, exacting a heavy toll from the enemy by forcing him to halt, mass, and finally attack against opposition which has skillfully moved back to the next position.

Situations Short of War

The Pentomic Infantry Division is a basic instrument of national security not only in war but in situations short of war.

Infantry divisions now are deployed as part of the worldwide deterrent forces of the United States Army. The interests of the United States and her international commitments may require that these or other divisions be employed in extension

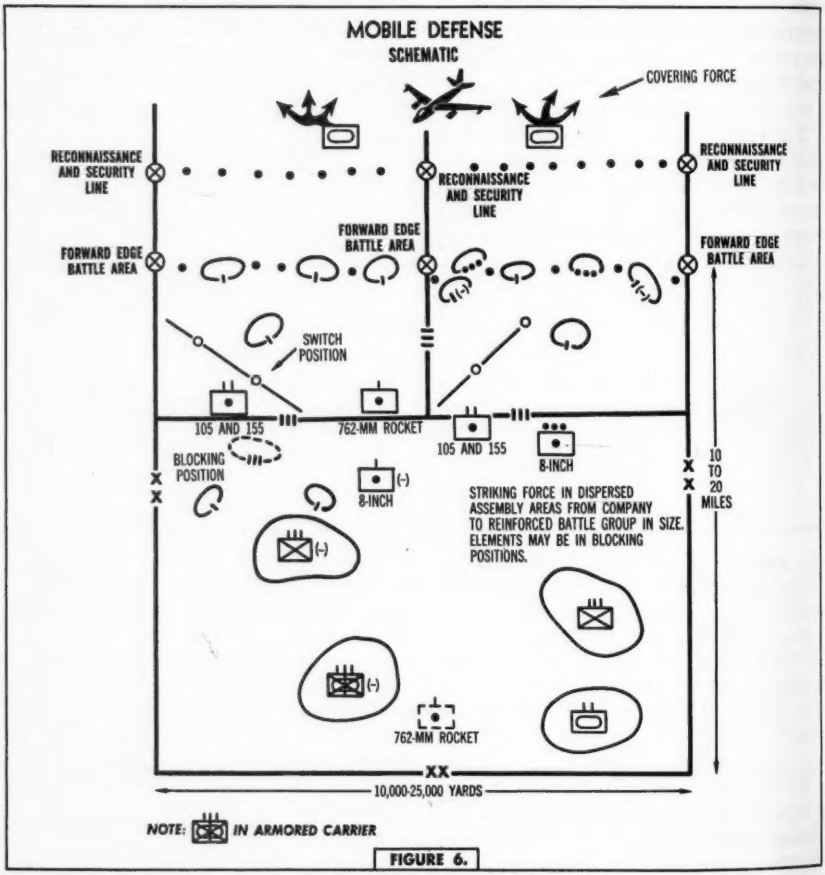


FIGURE 6.

of national interests but short of open hostilities. Examples of such situations short of war include show of force, truce enforcement, international police action, and occupation.

The basic qualities of training, discipline, and combat readiness, which make a good division in combat, contribute to success in situations short of war. The special considerations for situations short of war deserve particular attention. These include the normally delicate nature of the mission and situation; the probability of close cooperation with other services, with diplomatic agencies, and with forces of other nations; the importance of intelligence and the essentially different nature of intelligence activities; the requirement for security; the need for trained, disciplined, and smartly turned out troops; the necessity for meticulous dealing with local authorities and troops; the legality of actions, and the conflict between military necessity and other considerations; and the importance of circumspect relations with the press.

The division and its units have a variety of capabilities in situations short of war ranging from the sentry on post and the motorized or armored patrol, to the deterrent factor of a powerful organic atomic delivery means. The value of this capability to the Nation is enhanced by the strategic mobility of the division.

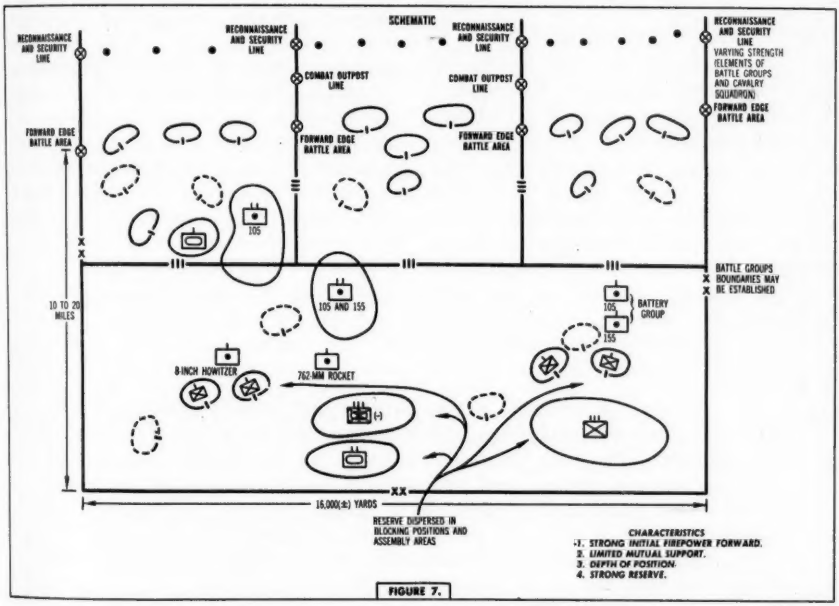


FIGURE 7.

Summary

A brief survey of doctrine for the Pentomic Division cannot be complete. In any event, this doctrine, like the division itself, is in a period of test and transition.

The status and background of the Pentomic Infantry Division and its doctrine are summarized in the Foreword of the United States Continental Army Com-

mand Training Text 7-100-2, *The Infantry Division,* March 1957:

The composition of the division is the result of intensive study of many types of organizations over a period of several years. Many of its features have been tested in the field, others may require change after additional experience. These divisions are being organized and trained to ensure that the Nation will have immediately available appropriate types of ground military forces which can be tailored to its needs; to provide to commanders of the combined arms an opportunity to work toward solutions of the problems of ground atomic warfare; and to provide at the end of a short transition period a modern effective ground fighting force, whose organization, equipment, and doctrine will have been combined for training into an integrated whole ready for the modern battlefield.

The actual conditions of battlefields of the atomic era are becoming more apparent as new analyses of developments continue. It is clear that more than ever the reward of objective taken will fall to the steadfast, resourceful American soldier with a sound knowledge of the tools of his trade and the will, determination, courage, initiative, and skill to use them well. A basic purpose of this text is to provide a body of doctrine for the infantry division as a point of departure in controlling and operating this organization effectively. The imagination and inspiration of intelligent leadership of these divisions remain an essentiality. Leadership, the unchanging element, is the foundation on which success of all units in combat will depend.

A sweeping reorganization of our airborne and infantry divisions according to the Pentomic concept has been in progress for some time, and is nearing completion. The term 'Pentomic' refers to the five battle groups which make up the new division, and also reflects its ability to fight under the stringent and fast-changing conditions of atomic warfare. We visualize the battlefield of the future as an area thousands of square miles in extent. We know it will be necessary for combat troops to be widely dispersed in order to minimize the effect of the enemy's tactical atomic weapons, yet they must be capable of swift concentration to provide an overwhelming assault force for the full exploitation of our own tremendous firepower. The Pentomic Division has been carefully tailored to these exacting requirements.

Secretary of the Army Wilber M. Brucker

ADMINISTRATION IN THE PENTOMIC INFANTRY DIVISION

Lieutenant Colonel Milton A. Pullman, *Infantry*
Faculty, U. S. Army Command and General Staff College

THE familiar triangular infantry division of the US Army has had a facelifting. The division has become five sided, with five battle groups as the basic maneuver elements, and other organizational and equipment changes effected to improve tactical capabilities in atomic warfare. To reduce the administrative load of combat units, changes and modifications also have been made in logistical procedures.

Distribution Procedures

Distribution of supplies to and within the Pentomic Infantry Division has been changed to reduce considerably the administrative load on the combat units. Classes I, II, and IV supplies (generally food, clothing, and repair parts) normally are delivered from field army supply installations, by field army transportation, to the division technical services. To the maximum extent practicable division technical services continue this unit distribution to battle groups, battalions, and separate divisional units. In the event circumstances make it more feasible for combat units to pick up Class I, II, or IV supplies directly from the division technical services (supply point distribution), sufficient transportation must be provided to the units from the division transportation battalion.

Class III supplies (gasoline and lubricants) normally are drawn by the quartermaster company of the division from field army Class III supply points. An important change in the handling of gasoline in the division is brought about by the use of organic gasoline tank trucks, with limited use of the familiar 5-gallon can. Within the division, either unit or supply point distribution may be used, with emphasis on unit distribution, when feasible.

Class V supplies (ammunition) are handled in the same manner as in the triangular division. Divisional units use organic transportation to draw Class V supplies from a supporting field army ammunition supply point (ASP). However, units of the division now are equipped with *5-ton* ammunition trucks and *2-ton* ammunition trailers to perform this task. When the distance from a unit to the ASP is great, the division transportation battalion or higher headquarters will assist the unit in moving ammunition.

Division Trains

Adoption of the division trains concept is the outstanding basic change in the administrative organization of the division. A typical organization of the infantry division trains is shown in Figure 1.

The division trains commander exercises *tactical* command over the service units which comprise the division trains. To facilitate exercise of this command, a trains headquarters detachment with a small

Organizational changes in the infantry division have created the necessity for corresponding changes in administrative support to ensure the maximum effectiveness of the division in any future atomic war

staff is provided by tables of organization and equipment (TOE). The division band is attached to the trains headquarters detachment for administration. *The trains commander is not responsible for technical operations. Division general and special staff officers retain primary responsibility for technical and administrative service activities.* Specific responsibilities of the trains commander include:

1. Tactical command and control of all units of division trains.
2. Organization of division trains for movement and disposition (coordinated with commanders of trains elements) in the service area.
3. Movement of division trains in accordance with tactical plans.
4. Protection and security of division trains.
5. Tactical training of personnel of division trains. This training is coordinated with technical training.
6. Supervision of administrative support of elements of division trains.
7. Conduct of inspections to determine the fitness of division trains units to perform tactical functions.
8. Preparation and implementation of rear area defense and area damage control plans for the division service area.
9. Supervision of organizational maintenance in division trains units.

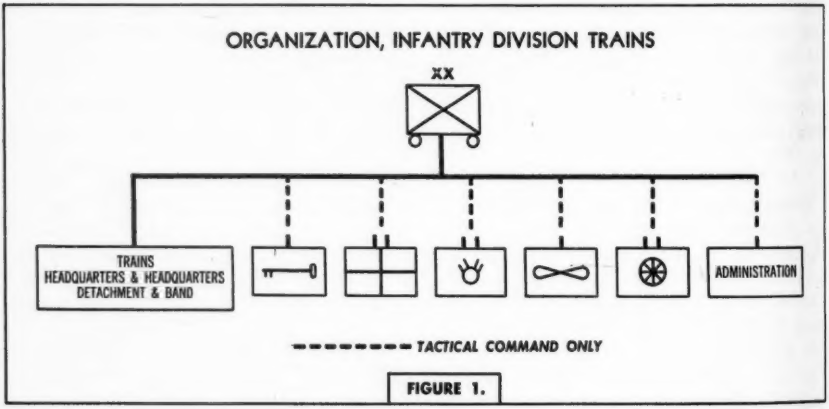


FIGURE 1.

The trains commander prepares and implements rear area defense and area damage control plans for the division service area, a difficult task in the era of atomic warfare, widely dispersed formations, and fluid situations.

Upon approval of the rear area defense plan and the area damage control plan the trains commander assigns defensive missions to elements under his *tactical* control. He must locate the units of the division trains so as to provide maximum all-around defense consistent with the ability of the installation to perform its basic

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Lieutenant Colonel Milton A. Pullman entered the service in 1941 and received his commission the following year. From 1942 to 1945 he served in Europe with the 755th Tank Battalion (1st Armored Group). He completed the Advanced Course of The Infantry School in 1947 and remained at the school as an instructor in the Department of Tactics until 1949. Following his graduation from the Regular Course of the U. S. Army Command and General Staff College in 1950, he went to Austria where he was in the G2 Section, Headquarters USFA. Returning to the United States in 1954, he was assigned to the G1 Section, Headquarters Fifth Army. Since July 1955 he has been a member of the faculty of USA CGSC.

mission of providing adequate and timely administrative support to divisional units. The division trains commander coordinates implementation of the area damage control plan so as to ensure minimum interruption of logistical support. In order to facilitate accomplishment of the rear area defense and area damage control mission the trains headquarters is provided with an effective communications net.

tion company is located in the division service area when feasible. However, due to its limited vehicular mobility (approximately 10 percent), it may be located behind the division rear boundary. Adequate communications must be allocated to permit it to function effectively in this rearward location.

The division administration center is formed when the division is in the field or

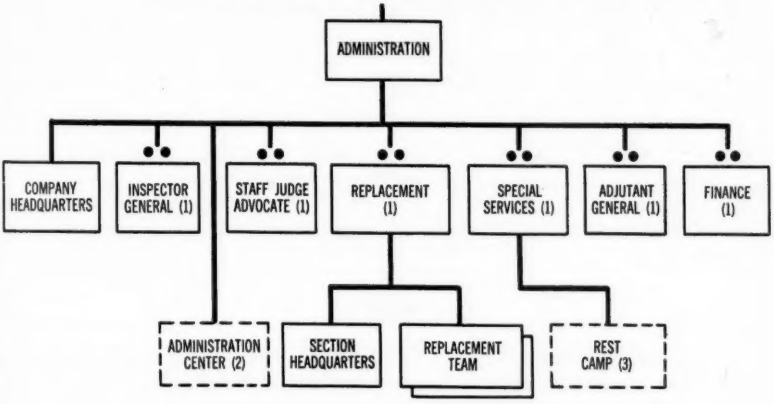
INFANTRY DIVISION ADMINISTRATION COMPANY
ADMINISTRATION
COMPANY HEADQUARTERS
INSPECTOR GENERAL (1)
STAFF JUDGE ADVOCATE (1)
REPLACEMENT (1)
SPECIAL SERVICES (1)
ADJUTANT GENERAL (1)
FINANCE (1)
ADMINISTRATION CENTER (2)
SECTION HEADQUARTERS
REPLACEMENT TEAM
REST CAMP (3)
(1) ASSIGNED FOR ADMINISTRATION.
(2) WHEN DIVISION IS IN THE FIELD OR IS DEPLOYED FOR COMBAT, UNIT PERSONNEL SECTIONS JOIN THE ADMINISTRATION CENTER AND OPERATE UNDER SUPERVISION OF THE ADJUTANT GENERAL.
(3) WHEN ESTABLISHED, IS OPERATED BY SPECIAL SERVICES SECTION.

FIGURE 2.

Administration Company

The administration company is a new unit in the infantry division and provides the nucleus for the division rear echelon (Figure 2). The company also functions as a carrier unit for certain special staff sections, the replacement section, rest camp, and the division administration center.

The rear echelon of the division headquarters which includes the administra-

deployed for combat. It consists of the personnel sections of divisional units operating under the supervision of the division adjutant general.

The division replacement section normally is located in proximity to the administration center and adjutant general section to facilitate coordination. Each of two replacement teams has a holding capacity of 100 replacements at any one time.

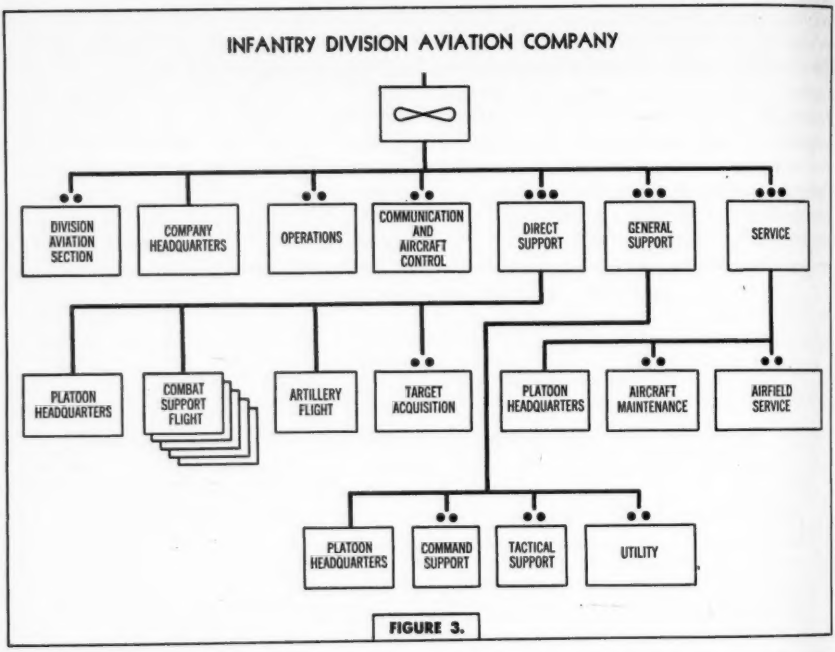

FIGURE 3.

Aviation Company

Another change in the division is the grouping of all organic aircraft into an aviation company (Figure 3). Comparative aircraft strengths, by type, are as follows:

	Pentomic	*Old Division*
Airplane, observation	16	13
Airplane, utility	6	3
Helicopter, reconnaissance	20	10
Helicopter, utility	8	0
Total	50	26

The company headquarters, general support platoon (which includes the division utility aircraft), and the service platoon normally operate from a base airfield established in the division service area and provide second echelon maintenance for division aircraft.

Although it is anticipated that the primary role of the aviation company will be combat support, when not so engaged the use of the aircraft for logistical operations should be planned.

Medical Battalion

The medical battalion of the new division is similar to that of the triangular division (Figure 4).

The medical battalion provides medical service to elements of the division and attached units on an area basis primarily. This service includes evacuation of patients from the unit area or aid station, triage, intermediate treatment, and/or preparation of patients for evacuation from the division area.

The clearing company establishes clearing stations which receive patients from

aid stations and units in its area of responsibility. The clearing stations accomplish triage, provide medical and surgical care, and either return the patient to duty or prepare him for further evacuation.

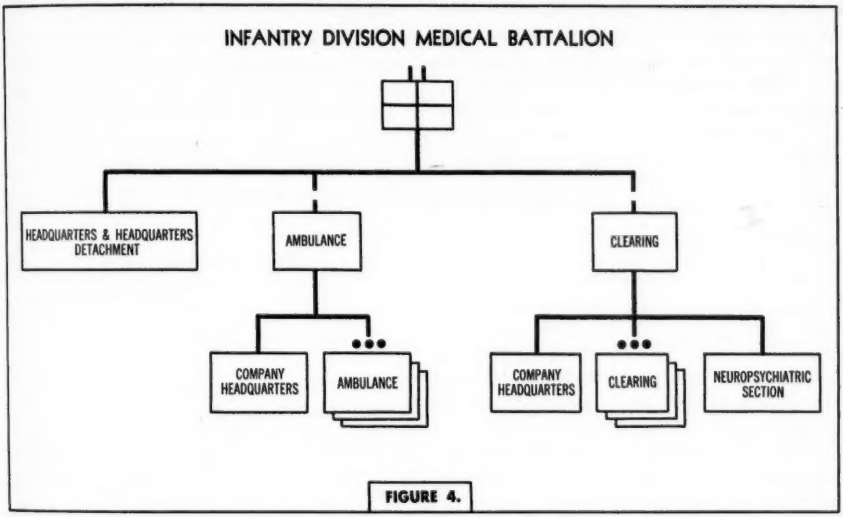

FIGURE 4.

The clearing company provides limited, emergency dental service. The neuropsychiatric section operates a mental hygiene and treatment facility. The company may operate one division clearing station utilizing one or more platoons, or a platoon may, with administrative augmentation, establish a clearing station to support a battle group or similar force.

The ambulance company evacuates patients from aid stations of combat and combat support units and from units in the division service area to a clearing station.

Maximum use is made of vehicles for evacuation, but army transport aircraft are used where possible, particularly for patients requiring emergency surgery. Critically wounded patients may be evacuated directly from the unit area or aid station to a field army medical installation.

Military Police Detachment

The military police detachment is not included in the division trains (Figure 1) since it is assigned to headquarters company of the division for administration. The detachment numbers 100 men, compared to the triangular division military police company of 167 men (Figure 5), and is under operational control of the division provost marshal.

The two military police platoons are employed in the division area to perform normal MP functions. They may operate throughout the division area exclusive of areas occupied by battle groups actively engaged, or they may support battle groups and/or task forces directly.

Ordnance Battalion

The mission of the ordnance battalion is to provide direct support ordnance service to the division. It also provides ordnance general supply support except for ammunition. Although special weapons support, including atomic weapons, is the responsibility of the field army, ammunition personnel of the division ordnance

battalion are trained in special weapons logistical matters. (See Figure 6.)

The battalion is 80 percent mobile and is organized to permit employment of elements in multiple locations. Although control normally will be centralized, elements may be attached to units for certain tactical operations. Emphasis is placed on movement of supplies and service to the place of use. Ordnance support is, in general, provided on a task and area basis, with elements supporting specified units and a portion of the division area.

The headquarters and the main support company normally are located together in the division service area. The battalion commander is also the division ordnance officer. The battalion headquarters provides command, administrative, technical, and operational supervision of organic elements and attachments. The division ammunition officer (DAO) is included in the headquarters of the battalion and provides administrative control of ammunition and special weapons supply to the division and attached units.

The main support company provides third echelon maintenance and general supply support to divisional units located in the division service area. It backs up the forward support company, provides vehicle evacuation support, and operates the division ordnance collecting point.

The forward support company normally operates separately from the headquarters and main support company. Elements are located to provide ordnance support to forward divisional units. There are six direct support platoons to support battle groups or task forces. Other divisional units in the forward areas also are supported by elements of the forward support company.

Quartermaster Company

The Pentomic Division retains the quartermaster (QM) company, but certain organizational changes have been made (Figure 7).

The QM company has no organic truck units where it formerly had three truck platoons. The majority of the administrative support trucks of the division are pooled in the division transportation battalion.

Instead of a graves registration section, the company has a recovery and disposition platoon. This platoon has five sections for support of the five battle groups, and a section to operate the division recovery and disposition collecting point. Army normally evacuates remains from the division collecting point to an army collecting point or cemetery.

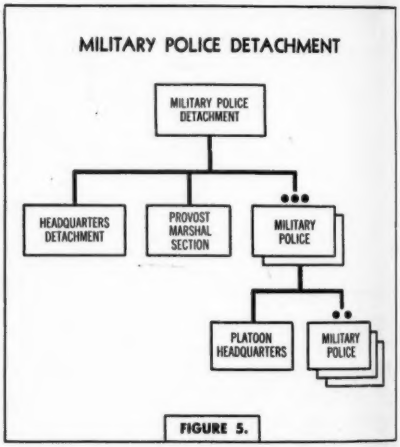

FIGURE 5.

The supply platoon includes three sections to handle Classes I, II and IV, and III supplies respectively. The division QM supply officer, in the office of the division QM, supervises operations of the supply platoon. Rations are requisitioned, based on unit ration requests, from the supporting field army Class I supply point. A change, mentioned earlier, is that field army normally delivers these rations to the division Class I distributing point. Here they are broken down and unit distribution is made to battle groups, battalions, and separate units, when feasible.

Necessary transportation is provided by the division transportation battalion.

The Classes II and IV section submits requisitions for nonregulated items to the QM Classes II and IV army depot on the basis of requisitions from divisional units. Requisitions for regulated items are forwarded to the army QM through command channels. Again these supplies are delivered by army to the division QM Classes II and IV section where they are prepared for unit or supply point distribution.

The division Class III section submits daily status reports, based on divisional unit estimates, to the army Class III supply point and obtains gasoline in bulk, using organic 5,000-gallon tank trucks. From the division Class III distributing point either unit or supply point distribution is made. The division has five 5,000-gallon tank trucks and twenty-eight 1,200-gallon tank trucks. Eighteen of the 1,200-gallon tank trucks normally are attached to various divisional units. The use of 5-gallon cans has been greatly reduced. Packaged petroleum products are transported from army supply points to the division distributing point in trucks provided by the division transportation battalion.

The QM company has a bath section with six shower units which may operate in six separate locations. There are no organic laundry units. Clean clothing is furnished by field army, with the division QM supervising exchange activities in proximity to established shower unit locations.

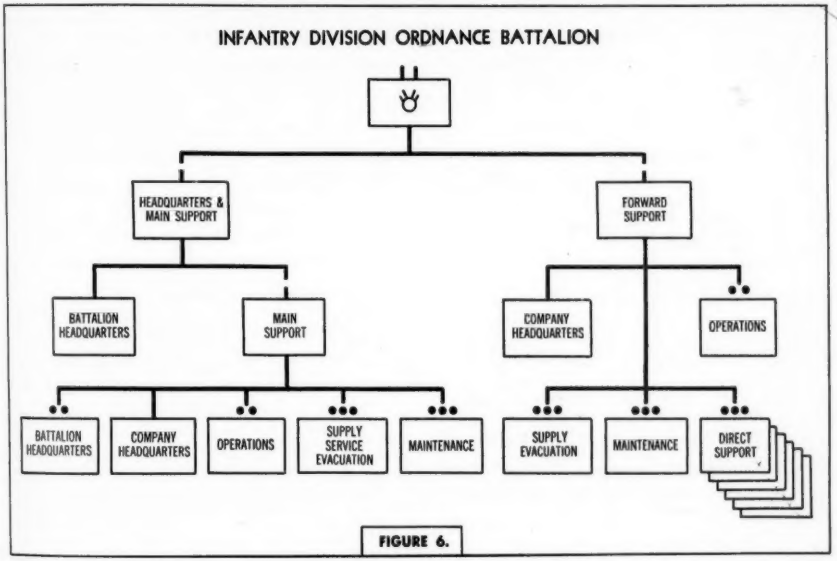

FIGURE 6.

Signal Battalion

The signal battalion of the Pentomic Division consists of a headquarters, headquarters and support company, command operations company, and a forward communications company. The administrative functions of the battalion include signal supply and maintenance.

The division signal supply and maintenance section handles repair parts, replacement components, other signal Classes II and IV supplies, and signal salvage.

Signal supplies normally are delivered to the division by army. Unit or supply point distribution is used within the division, depending on the tactical situation.

Mobile repair teams of the forward communications company provide signal maintenance support to divisional units. Five "forward" teams operate from forward signal centers in continuous support of battle groups and other combat and service units in the area. This maintenance normally is performed by direct exchange of defective items or subassemblies. Four "special" teams furnish general support to the division:

Team 1.—General signal repair, including telephone, teletypewriter, cryptographic, and photographic.

Team 2.—Radio and radar repair.

Team 3.—Radio and *avionic* equipment repair.

Team 4.—Radio, radio relay, and carrier repair.

These "special" teams are dispatched to unit locations, as required.

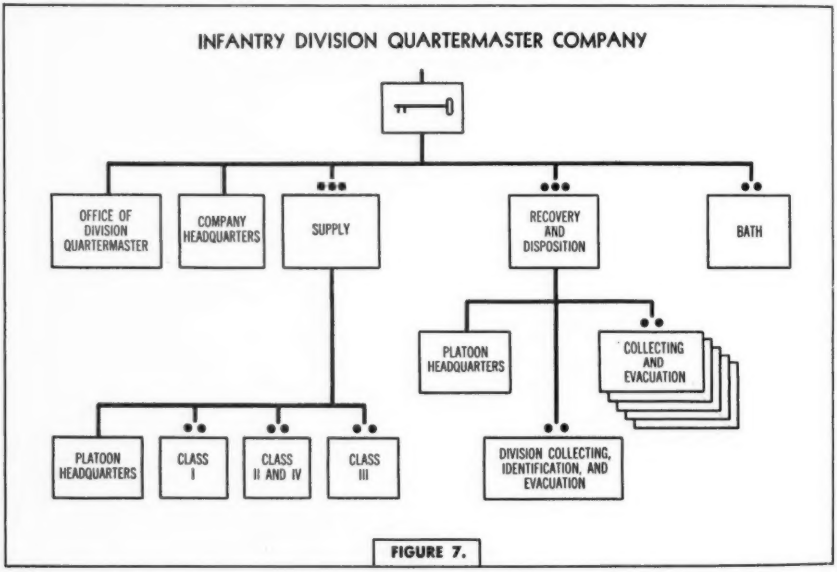

FIGURE 7.

Transportation Battalion

An entirely new addition to the division is the transportation battalion which includes transportation corps personnel.

The transportation battalion provides tactical mobility to assault elements of the division and furnishes vehicles for administrative purposes. (See Figure 8.)

Based on 75 percent vehicle availability and considering the desirability of maintaining the tactical integrity of rifle squads and platoons, the two armored carrier companies can lift the assault elements of a battle group. Also based on 75 percent vehicle availability, the truck transport company can motorize one battle group.

The transportation battalion commander also is the division transportation officer and establishes his division transportation section at the main command post. This section is the nucleus of the division movement headquarters which includes provost marshal, aviation, engineer, and surgeon representation. It coordinates air and ground transport requirements with ca-

pabilities, and assists the G3 and G4 in preparing transportation and highway regulation plans, orders, and reports. It also effects necessary coordination with army air and ground transport moving into and out of the division area.

Organic transportation units and units attached from higher headquarters are under the operational control of the division transportation officer, when not attached to divisional units. For tactical operations, transportation units may be attached on a mission basis for a specified time, or may be placed in support.

The transportation battalion furnishes vehicles and trailers for administrative operations on a task basis. Logistical support missions are planned to maintain unit integrity, whenever possible. A platoon of the truck transport company is detailed to meet daily administrative commitments and the remaining three platoons are reserved, when possible, for tactical tasks. The commitments are rotated periodically among the four platoons.

Normally, armored carrier companies are not employed in administrative support operations. However, unit distribution of supplies, or movement of replacements to tactical units, is accomplished by armored carriers, when required.

Summary

The Pentomic Infantry Division administrative and technical service units have been outlined in general terms. Major changes and/or modifications are:

1. Increased emphasis on unit distribution from field army and within the division.

2. Bulk transportation of gasoline by tank trucks, rather than in 5-gallon cans.

3. Adoption of the division trains concept, including a trains headquarters, commander, and staff.

4. Addition of an administration company which serves as a carrier unit for elements of the division headquarters rear echelon.

5. Addition of an aviation company of 50 aircraft.

6. Organization of a military police detachment, rather than a company.

7. Replacement of the signal company by a signal battalion with increased capabilities.

8. Addition of an organic transportation battalion (transportation corps) consisting of a headquarters and headquarters company, a truck transport company (80 trucks), and two armored carrier companies.

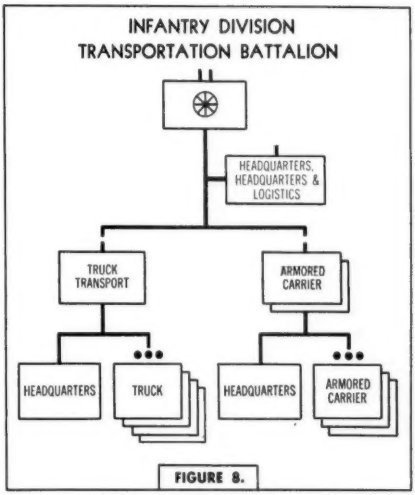

FIGURE 8.

Administrative support changes as outlined are geared to the mission and organization of the Pentomic Infantry Division and designed to increase the effectiveness of the division as a fighting force in the atomic era.

The Army of the Future--

ORGANIZATION

Major J. H. P. Curtis, MC, *British Army*
The King's Royal Rifle Corps

This is the second article of a two-part series in which Major J. H. P. Curtis, British Army, discusses the changes in tactics and organization of ground forces required in the conduct of atomic warfare. Last month Major Curtis presented a reevaluation of tactics and methods of employment of ground forces. In this issue he outlines a proposed organization of these forces to conduct operations employing tactical atomic weapons more effectively.—Editor.

The Future

When it is appreciated that no two soldiers can agree on the ideal organization for the present infantry battalion, let alone the division, it will be readily agreed that to try and suggest an organization for a field army 20 or 30 years hence is a formidable task. An American general recently remarked, "The military is more receptive to new weapons than to new ideas for their use." This is very true since new weapons give us quite enough to worry about in the present without concerning ourselves about the future.

Nevertheless, the problem must be tackled since the weapons of today take years to perfect and can become obsolete before they ever become a general issue. We must learn to think further and further ahead if we are to be properly equipped at the vital moment when war breaks out, a moment that no man can foretell. The soldier must remember that it is he who tells the scientist what the army requires. If the soldier cannot now indicate the type of weapon he will require 20 years hence he must not blame the scientist if it is not there when the time comes.

The organization presented here is founded on the principles which have already been enumerated. New nomenclature has been used for the formations. This is because a new era deserves new names and to avoid any statistical comparison with the present-day formations. The only method by which the tremendous saving in manpower, weapons, and vehicles can be measured is in relation to the effective frontage that the new formations can cover.

The yardstick to keep in mind is that 12 years ago a division of 18,000 men, 3,000 vehicles, and some 80 guns was only fully effective when it was operating on a frontage of six to eight miles.

The Atomic Group

We must establish at the outset what is to be the tactical combat team for the atomic war of the future. It must be powerful, mobile, as small as possible, and,

The military revolution caused by the introduction of atomic weapons is just beginning. Unless both our ideas and our forces are reorganized immediately, we will be in no position to survive an atomic conflict

if it is to do all that will be demanded of it, must include the correct proportion of all arms.

A battery of two atomic field guns will provide enough hitting power to dominate the local tactical situation. This battery using two dispersed gun positions can cover a frontage of some five miles which, in turn, requires a light armored squadron if effective observation is to be maintained by day. At night two infantry companies, provided they are mobile, will be sufficient to maintain a line of standing patrols. It is suggested, therefore, that the tactical team, termed the atomic group, be composed as follows:

1. A light armored squadron of six troops.
2. Two mobile infantry companies.
3. One battery of two atomic field guns.
4. One platoon of field engineers.
5. A headquarters and a small echelon containing the administrative vehicles from each of the subunits.

Such a group need consist of no more than 500 officers and men—half of whom will be infantry—and 100 vehicles. This results in an organization smaller than that of the present infantry battalion yet one which offers complete tactical domination along five miles of battlefront in normal European terrain. In open country or along a good obstacle this frontage might be increased somewhat; in very close country it may decrease. We can, however, take five miles as the tactical norm of the atomic group.

The Tactical Group

The tactical group is the command echelon for the atomic groups. The idea of including a great number of atomic groups under this headquarters is attractive but is likely to be impracticable since it would require an expansion of the light armored and artillery regiments and the engineer company beyond the limit which long experience has proved sound. In addition, since the frontage covered by a tactical group of three atomic groups may be anything from 10 to 15 miles, the communication factor becomes important. Moreover, in atomic warfare the personal touch of the commander will continue to be of vital importance. The greater his command and frontage, the less that personal touch will become.

The tactical group, therefore, will consist of:

1. A headquarters.
2. One light armored regiment of three squadrons.
3. Two infantry battalions each of four companies.
4. One artillery regiment of three 2-gun batteries.
5. One company of engineers.
6. One casualty collecting unit.
7. An administrative group which will include a Royal Electrical and Mechanical Engineers (REME) recovery and light aid detachment.

The Light Armored Regiment

The tasks of the light armored regiment supported by atomic artillery will be exploitation, observation, and the denial of ground. It can be organized on the same lines as the present armored car regiment, with each squadron consisting of five reconnaissance troops and one heavy troop. The heavy troop in each squadron will

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Major J. H. P. Curtis attended Eton College; the Royal Military College at Sandhurst; and the Advanced Associate Course of The Infantry School, Fort Benning, 1957. Commissioned in 1939, his World War II service includes duty in North Africa and Italy; and with Headquarters Northern Army Group as military liaison with US First and Ninth Armies. After the war he was an instructor at the Middle East School of Infantry; served in Italy with the 1st Battalion, King's Royal Rifle Corps; was chief instructor, Tactical Wing, of the Command and General Staff College, Quetta, Pakistan; deputy assistant and quartermaster general of an infantry brigade in the British Army of the Rhine; and now is executive officer, 1st Battalion, King's Royal Rifle Corps.

require medium range antitank weapons, based perhaps on the guided missile principle, so that defensively the squadron can hold its own against targets which are too close or too small to warrant an atomic shell.

The vehicle required for this regiment is a multiwheeled turreted armored car mounting a good high-velocity gun and a machinegun. Such a vehicle can have a cross-country performance almost equal to a tracked vehicle, while its range, speed, ease of maintenance, and silence in operation will be far superior.

The regiment will require a section of approximately six helicopters to increase its power of reconnaissance, on the efficiency of which all offensive and defensive operations will depend.

The Infantry Battalion

The infantry battalion must be mobile. Marching alone will not give it the degree of mobility which will be required in the type of warfare envisaged above. In the past supply vehicles have been used when it was necessary to transport infantry quickly from one part of the battlefield to another. A sharp dividing line was drawn between the infantry manning the trenches and the infantry supporting the armor. It has been recognized since the 1930's that the latter, operating as it does under mobile conditions, requires its own vehicles.

In the future when static defenses are no longer possible the infantryman, if he is to be of real value in a mobile war, must have the same mobility as the force which he is supporting. Moreover, he must have the same type of communications and these he cannot carry on his back. Supremely mobile the infantryman may be, but his speed is three miles an hour. It is only by allying himself with motor transport that he can obtain the additional speed and range of action which is required. Since it will be out of the question in the future to provide supply vehicles for his transport, he must have his own tactical vehicles.

The battalion, shorn of the need for supporting weapons, and with much of its administrative responsibility taken over by the tactical group, will require under 100 vehicles to make it completely mobile.

The two battalions in the tactical group will provide two companies for each of the three atomic groups and a reserve of two companies which will be at the disposal of the tactical group commander. The reserve will be essential for supplementary patrolling, the local protection of guns, counterpenetration tasks, and the reinforcement of atomic groups as necessary. The total strength of a battalion should not exceed 650 men, 480 of whom will be in the fighting companies.

Atomic Field Artillery

The field regiment of six atomic field guns is the vital unit of the tactical group. The aim of the commander will be to place his guns in a position from which they can inflict the maximum damage on the enemy, while his armored and infantry units will be disposed so as to secure the best points of vantage for the artillery observation officers. No concentration of fire will be required; one gun covering one line of approach will be enough.

A battery of two guns with a range of not less than 15,000 yards will be sufficient to cover an atomic group frontage of five to six miles. Each gun will operate individually, perhaps two or three miles apart. It may not be necessary to fire more than one shell from one gun position. The mobility and ease of concealment of a single gun will be very considerable and tactically of great importance. One vehicle for each gun may well carry the total requirement of atomic shells for the entire war. If replenishment is required, however, a single helicopter landing at the gun position, or at a rendezvous close in rear, will be able to bring perhaps another 25 shells or more.

An artillery regiment of six guns may appear somewhat out of proportion. However, these six guns will play a vital part on their sector of the battlefield. A two-gun battery will require more forward observation officers than in the past, while the survey, meteorological, and other technical requirements will tend to increase. Over-all, however, there will be a big reduction in the number of men and vehicles required.

Engineers

The engineer company in the tactical group will possess two main tasks. In the advance it must construct the ferries which will be needed to get the atomic groups across water obstacles. In defense the demolition of bridges and preparation of obstacles on likely lines of advance will be of vital importance.

Since crowded bridgeheads and permanent bridges will be too vulnerable to atomic counterattack the crossing of an obstacle must be carried out on a broad front.

Each atomic group must have the means of ferrying its own vehicles across in one night. Since none of its vehicles will weigh more than 10 tons, this problem is not a great one.

A reserve company will be essential for taking over ferry sites and subsequently building permanent bridges, so the engineer regiment for an atomic force must be organized on a basis of four companies.

Atomic Force

The tasks of atomic force headquarters will be to:

1. Direct and coordinate the operations of three tactical groups on a frontage of 30 to 40 miles.

2. Carry out tactical interdiction against the enemy's supply lines and reserves on its own frontage to a depth of 75 miles.

3. Support neighboring forces with atomic missiles as directed by army.

4. Provide the administrative backing for the tactical groups.

The headquarters must be completely mobile and as small as possible, certainly no larger than the present divisional headquarters, and should be divided into two echelons. There will be an urgent need to increase the efficiency of communications since the present types of shortwave radio sets are neither reliable in bad atmospheric conditions nor sufficiently secure from direction finding and interception. It will be unthinkable in the future continually to broadcast the position of our headquarters as we do now. Three accurate bearings onto the source of radio signals will enable the enemy to dispatch an atomic rocket straight to the center of operations. We can assume that it will be accurate to within half a mile.

The answer to this problem of communications probably lies in a greater development of the direct link, or radio relay as it is called. Even this method is liable to a certain degree of interception at present. Perhaps a new method of intercommunication will appear based on television or some principle not yet known. Whatever the answer may be, the need for communications capable of meeting the demands of a fluid battle on a very wide front will be vital.

Supporting Arms

To carry out long-range interdiction an atomic force will require one unit of rocket projectors which will be termed a heavy artillery regiment. With two batteries each of two rocket projectors, having a maximum range of 75 to 100 miles and a third battery of ground-to-air guided antiaircraft missiles, this regiment will possess the necessary power to dominate the tactical battlefield and the air above it.

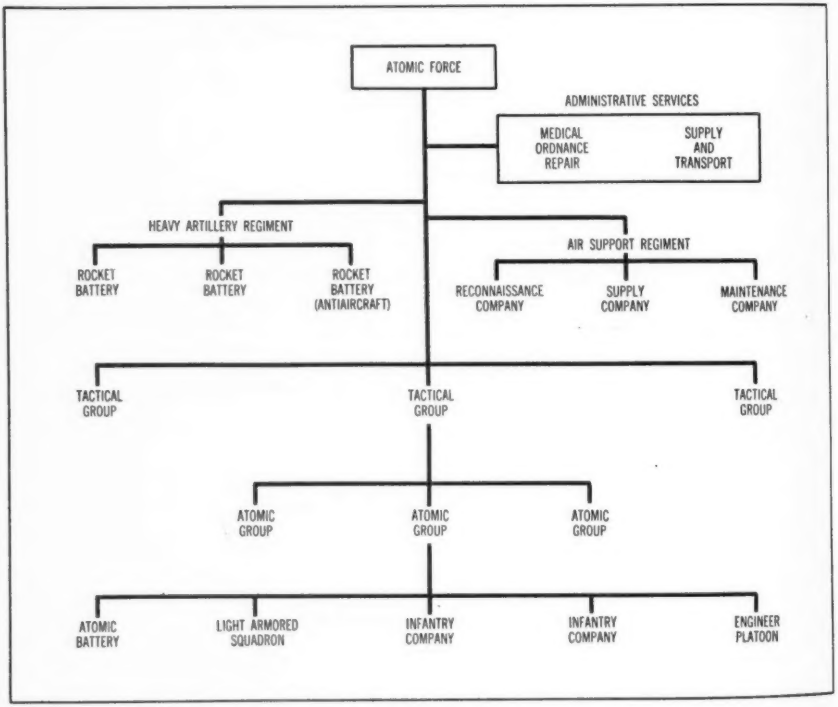
If these long-range rockets are to be effectively employed, accurate and timely information will be of paramount importance. Information from ground sources

will play an important part but often air reconnaissance will be the only method of securing or confirming details of enemy targets. The means of securing this information must be entirely at the disposal of the force commander. Each force will require its own unit of tactical reconnaissance aircraft. A small 200-mile-an-hour fixed-wing aircraft capable of taking off on a runway of not more than 200 yards is

aircraft using atomic missiles. The targets which the army is likely to ask the air force to attack early in the battle are enemy fighter airfields and base supply installations. The former will be high on the air force list of priorities.

Administrative Services

An atomic force will require administrative services similar to those in our



required. In addition, this army air unit should have a helicopter section whose primary task will be supply and casualty evacuation. All these aircraft should be flown and maintained by army personnel. Air force responsibility, coordinated at army level, will begin at approximately 100 miles beyond the frontline and will, therefore, employ only high performance

present-day divisions, but all except the medical units will be greatly reduced since they can be scaled to the new pattern of:

1. Smaller numbers of men and vehicles to maintain.

2. A standard range of light vehicles requiring lighter and fewer spare parts.

3. Greatly reduced supply tonnages, particularly of ammunition.

We may expect to find a medical organization of three casualty holding units which will both receive and evacuate casualties by ambulance or helicopter. A REME organization of two light workshops with the necessary spares and an ordnance field park also will be necessary. Finally, there will be the all-important Royal Army Service Corps (RASC) supply unit which will have the task of transporting forward the POL, rations, and ammunition by truck or helicopter, drawing its requirements from small dumps established in the army rear area.

It will be observed that the atomic force has much the same structure as the present-day division. Its firepower, however, will be greater, giving it both offensive and defensive power far beyond that presently wielded by a division. The force will cover a frontage, allowing for a reserve in depth, of at least 30 miles and its mobility and range will far exceed that of any present-day formation. Yet with all this such a force need consist of no more than 15,000 officers and men, 3,000 vehicles, 18 guns, 6 rocket projectors, and perhaps 50 aircraft.

Three small formation headquarters and one larger one will constitute the entire command structure for 30 miles of front-line.

With an improvement in communications, the necessity for which has already been mentioned, these headquarters should have no difficulty in controlling the battle on these wide frontages. The complicated plans and intricate staff work required by the old methods no longer will be necessary. Guided by a general directive the atomic and tactical group commanders will have the power at their disposal to carry out the plans of the higher commander without recourse to constant regrouping and reinforcement. It will not be necessary to interpose a corps headquarters between army and the atomic forces. An army commander should be capable of directing the operations of up to five atomic forces, while the latter must be capable of assuming the tactical responsibility previously accomplished by corps.

Diagrammatically the organization of the atomic force of the future might appear as follows:

Total of Major Units

6 infantry battalions
3 light armored regiments
3 field (atomic) regiments
1 heavy (guided missile) regiment
1 field engineer regiment (4 companies)
1 air support regiment

Flexibility of the New Organization

While the primary object here has been to suggest the type of ground forces required for a nuclear land battle, it will not be out of place to consider briefly the other uses to which an atomic force can be put without any radical change in organization.

First, since all units are lightly equipped, it is easily air transportable. A tactical group with an air assault scale of transport and its atomic guns will be a formidable force for the reinforcement of a threatened area in either peace or war. In addition, subject to air superiority, the fact that such a force can be landed in the enemy's rear has endless possibilities.

The second consideration is one that concerns us greatly when a large part of our army is engaged in internal security. The most suitable units for this work are infantry and armored cars. Tanks are useless for patrolling a road in Cyprus or moving to a locale in the Aberdare Forest. The components of the atomic force, however, are primarily infantry and armored cars; although atomic artillery may be of no use in such situations it can, if necessary, use conventional high-explosive shells.

The proposed organization, therefore, is suitable and economical for wars whether they be cold, warm, or hot.

Conclusion

There will be those who will argue that the proposed organization will be too easily penetrated and lacks the ability to stabilize a battlefield. Others may say that there is not enough armor for "real punch" or too few infantry to cope with the patrolling on so wide a front. The temptation to add on a bit here and there and increase the weight and number of the conventional and well-tried weapons will be great. The abandonment of the policy of holding ground for one of selling ground dearly and bidding farewell to the heavy tank, which has taken 30 years to perfect, are both large pills to swallow. The doubters, shutting their eyes to what is not just speculation but virtually established fact, will say that atomic artillery on the scale suggested cannot possibly become a practical proposition. The very advanced school may say that the organization has not gone far enough and that the infantry, for instance, should be entirely dependent on helicopters for its mobility.

The military revolution, however, caused by the introduction of atomic weapons is just beginning and it is becoming increasingly clear that our present-day army is no longer a suitable instrument for waging war under the new conditions. Unless both our ideas and our forces are reorganized, we will be in no position to survive an atomic conflict. We must look ahead clearly and boldly and decide what is needed, for a future war will not allow years in which to develop and perfect weapons and organizations. The decisive stage will develop in the first week and may last only a month. It is on this small margin that our civilization and liberty may rest.

The atomic force suggested is based, therefore, on the following precepts:

1. That the atomic missile will dominate the battlefield as the rifle, the machinegun, and the tank have each in their turn dominated it in the past.

2. That complete mobility and the ability to fight dispersed both laterally and in depth without, at the same time, losing the power to destroy the enemy at every opportunity will become essential.

3. That the nuclear bombardment in the rear areas will seriously curtail the administrative potential. The maintenance of large static forces or mobile forces containing heavy tanks will, therefore, become no longer possible.

These principles will emerge more clearly as time goes on and today, when the need to look clearly into the future is vital, they must be the three firm planks on which to build our fighting forces. Any force which does not measure up to the requirements dictated by these principles will perish on an atomic battlefield.

As Sir Frederic Brundrett, KBE, CB, the Scientific Advisor to the Ministry of Defense, stated:

Where does the new balance lie between offense and defense in this hypothetical land war where atomic weapons are freely used? I do not yet know. We must discuss it thoroughly and freely, because it is very important to decide where the right answer lies. . . . Is it that the days of massive assaults against massive defenses are over in this kind of war? Is the proper picture of a battle on land in atomic war that of the mixing of two swirling gases, each molecule not important enough to take account of by itself, but the final outcome decided by a multitude of small and almost individual engagements? If that were to be the right picture—and I do not say that it is—it seems to me that organization and communications would be very different in all armies; and the curious outcome of major and terrible scientific advances is to throw back the responsibility for the battle unmistakably on to the shoulders of the individual soldier.

It may be that the molecule which Sir Frederic envisages will be the atomic group with two atomic guns as its nucleus.

THE ART OF MILITARY COMMAND: An 11th Century View

Robert Devereux

THE art of warfare has undergone constant and far-reaching changes during the course of history. In most aspects warfare as practiced in 500 B.C., for example, when Sun Tzu wrote *The Art of War*—the oldest military treatise known to exist—bears little resemblance to warfare today. Through the centuries, however, one element of warfare has changed but little: the art of military command. Other things being equal, the army most competently commanded usually has achieved victory.

This vital role of military command always has been recognized by writers who concerned themselves with the art of warfare, whether they represented small obscure states or the major empires of their day. This article will examine the observations on the role of a military commander as set forth by a little-known Central Asiatic writer of the 11th century. If, in detail, some of his observations have lost their relevancy, the basic concept—an army's success depends largely on the qualities possessed by its commander—remains valid.

From the eighth to the 12th centuries, the Uigurs, under the Karakhanid dynasty, constituted the ruling people in that part of Central Asia centered about Kashgar, the principal city of the area now known as Sinkiang. It was in the year 1069 A.D. that Yusuf Khass Hajib, a native of Kashgar and a member of the Khan's court, completed a work entitled *Kutadgu Bilig (The Art of Reigning)*.

Duties of the Commander

In his discussion of the structure of the contemporary government and society, Yusuf devoted one chapter to the duties of the military commander in chief and to the qualities which the Khan must seek in those appointed to that important post (only the Khan himself ranked higher).

Yusuf wrote:

The chief tasks of a commander are to command soldiers, to organize armies, and to defeat the enemy. All of these require a man of experience and strong will. . . . The commander must be a brave man, hard as steel and known for past heroisms, who will not quaver when he sees the enemy. . . . He must be brave, intelligent, wise, and merciful.

Warfare in the 11th century was, of course, a matter of hand-to-hand combat in which all ranks participated, hence Yusuf's emphasis on bravery. He returns to this theme again and again:

He must be brave, for if the commander is brave even the coward acquires courage. But one coward can destroy the whole army. . . . When an army is defeated, one

One element of warfare—the art of military command—has changed but little during the course of history. An army's success continues to depend largely on the qualities possessed by a competent commander

soldier corrupts another. . . . Let the commander not fear death. . . . The appointed time of death is fixed for everyone and only he who forgets death will defeat the enemy. . . . [Therefore] the commander must be brave so that the soldiers may draw courage from him. If the commander is brave, the whole army will be brave. If a lion acts as a guide for dogs, all the dogs . . . will be lions. But if a dog guides lions, all the lions will be like dogs.

Planning and intelligence were recognized as essential elements of warfare. "The commander," wrote Yusuf, "must be alert and cautious . . . and must never be subjected to an unexpected attack. . . . He must always be alert and informed about the enemy."

The armies of Yusuf's day generally were animated more by hopes of booty than by sentiments of loyalty, national pride, outrage, or vengeance, and this frequently led to disaster when soldiers abandoned the fight prematurely to stop and collect booty. In a later day this was to lead Genghis Khan to decree the death penalty for any soldier who turned to looting before the standard had left the field. Yusuf was aware of this problem, and his solution was to urge upon the commander a generosity which would instill in the soldiery a measure of personal loyalty and would satisfy their cupidity:

[The commander] must be generous, for he can organize armies only by distributing much money to the soldiers. . . . He must himself be indifferent to such things as family and wealth. . . . He should divide his wealth among his soldiers, retaining for himself only a horse, clothes, and weapons. . . . He must feed, water, and clothe his cavalry and foot soldiers and must give them much.

Yusuf recognized that a successful commander must possess certain qualities. Speaking in his usual epigrammatic style, he declared that "the commander must not drink wine and must avoid dissipation, for authority flees before these two acts." Other traits to be avoided are falsehood, pride, and parsimony:

The commander must always speak the truth, for if the great lie the people will have no confidence in them. . . . Pride is not becoming to a commander, for it will lead him to stray from the path of justice. . . . He must eschew parsimony, for no one approaches a miser.

In summing up the requisites for a successful military leader, Yusuf concluded that ". . . four qualities are necessary for a commander: a straight tongue, generosity, courage, and an ability to recognize tricks."

Army and the State

Yusuf then turned his attention to the role of the army in the state and the relationship which should exist between it and the civilian arm of the government. The Uigurs of his day were essentially peace-loving agricultural and pastoral people, but they understood the importance of an army. In that era, as in most others of history, the people, regardless of how devoted to peaceful pursuits, had to be ready to fight when necessary if the state were to be preserved. Yusuf framed this idea in these words:

An army is necessary for the state. . . . The Khan must be rich in order to raise an army. And for the Khan to be rich the people must be rich. Therefore, just laws are necessary . . . for the well-being

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of the people. If one of these factors disappears all four [that is, army, rich Khan, rich people, just laws] will disappear. And if all four disappear the state too will disappear.

While Yusuf thus acknowledged the vital importance of an army to the survival of the state, he emphasized that the army was not to be considered as all-important and that the civilian arm was equally necessary. He wrote:

Two officials are necessary for the state: the vizier and the army commander. One wields the pen, the other the sword. These two organize the state, and if they cooperate no one can divide them. Territories are taken by the sword but they are governed by the pen.

Conclusion

Yusuf concludes his chapter on the art of military command with a thought on the role of the army as an instrument of national policy, which might well have served as the inspiration for Teddy Roosevelt's famous dictum, "Speak softly but carry a big stick." As our 11th century author phrased it:

> **Three things are necessary for the Khan, the country, and the government: a sword in the right hand, a gift in the left hand, and soft words in the mouth.**

The metamorphosis now taking place in your Army . . . is much more than just a state of mind. It is a matter of *muscle*—combat muscle to cope with immediate and very real dangers that could materialize tomorrow at any one of a dozen hot spots in today's troubled world.

By muscle I mean *men*—not just military machines. The most marvelous weapon that technology can ever produce is just a tool in the hands of a man. Upon his human skill and determination to use his tools, all else in war depends. Every tool of war devised by man, whether it swims in the sea or flies in the air, is designed for just one purpose: to prepare for and support the operations of your Army where the enemy lives—on the ground. So no matter how high our minds soar, the decisive factor in our response is MAN on the ground and his leadership there.

Today . . . your Army has more men on the ground, under arms and training, than at any previous time in our Nation's peacetime history. The healthy growth in military muscle has been achieved despite the budgetary compression and the phased reduction of your Active Army during the past year.

General Willard G. Wyman

Limited War and the Scholars

Colonel G. A. Lincoln, *United States Army* and
Lieutenant Colonel Amos A. Jordan, Jr., *United States Army*

AMONG the recent spate of books dealing with various national security subjects are two of particular interest to Army officers:

Limited War, Robert E. Osgood (Chicago, University of Chicago Press, 1957); *Nuclear Weapons and Foreign Policy*, Henry A. Kissinger (New York, Harper & Brothers, 1957). Both volumes forcefully and learnedly expound the case for a policy of graduated deterrence and limited war. Both are being widely and sympathetically read by responsible civilian leaders in Washington and elsewhere. Dr. Kissinger's book already has hit the best seller lists and is being widely hailed on both sides of the Atlantic. Although Professor Osgood's volume, having been printed by a university press, has not received the publicity given the Kissinger book, it, too, has been in short supply in Washington bookstores.

It is probably wiser to begin with Osgood's volume, since it is both shorter and easier to read than Kissinger's, and also since its scope is narrower. Moreover, Osgood's analysis leans more heavily on history than does Kissinger's thereby furnishing a useful backdrop for the discussions in both books.

Osgood's Four Sections

Osgood's thesis is that the United States can and must "develop a strategy capable of limiting warfare and fighting limited wars successfully." His book can be usefully considered in four sections. The first section tackles the theoretical rationale of limited war and traces the history of warfare in order to show how limited war has increasingly given place to unlimited war. Osgood ends the first section with the conclusion that:

We cannot know whether total war is impossible or inevitable; we can only estimate probabilities. . . . There is only one rational choice: to act on the assumptions that wars, though they are not entirely avoidable, may at least be limited; to bend every effort to develop a strategy designed to maintain American security by methods that maximize the prospects of limited war while minimizing the dangers of unlimited war.

The second portion of the book examines military policy and military programs since World War II, finding very little that is heartening to an advocate of the limitation of war. Osgood's historical analyses and judgments are thickly salted with moderate qualifications indicating his appreciation of the pitfalls of hindsight and of the uncertain ground he may be on when all the records are available.

In the third section, occupying the bulk of the remaining pages, the author, having already shown there is not now an adequate supporting program in US policy for his thesis, outlines a limited war strategy for the United States.

Problems related to the development of our national policy and the application of resulting strategy to critical issues are analyzed in two volumes containing information of interest to both military and civilian

In the fourth and concluding portion of a few pages, Osgood faces squarely the truth recognized in the first portion of the book: A US strategy of limited war depends on a transformation of the traditional American approach to war and to the relation of force and policy. He is optimistic about the practicability of this transformation.

National Objectives

Osgood begins his volume by setting forth general principles concerning the relationship between military power and national policy. He asserts that two principles are basic: political primacy and economy of force. He considers that as the dimensions of war increase, the principle of political primacy is increasingly in danger of being subordinated to immediate military considerations, with the gravest probability of disaster to all concerned. If war is to be susceptible to political control, then whatever force is used must be on a scale commensurate with the objectives to be achieved. Hence the two principles are interrelated in their application.

The nature of national objectives in warfare is of overriding importance. Limited wars tend to be for limited objectives, whereas unlimited objectives breed unlimited wars. Looking at the flow of history from the Peace of Westphalia (1648) to 1914, Professor Osgood notes that international wars were limited—except for the French Revolutionary-Napoleonic Wars. The reasons are not hard to discover. Political leadership usually chose limited objectives and, moreover, the state of the warmaking art limited the military force that could be mobilized and brought to bear on those objectives. Napoleon, a revolutionist with unlimited political objectives, unprecedented methods for mobilizing military force, and mass national support, threatened the condition of equilibrium. After Napoleon's defeat the great powers got the situation back in hand for another century. During that century the advances of the Industrial Revolution made unlimited war technically and economically feasible, so that when the unstable political equilibrium of Europe was upset in 1914—triggering a resort to force—catastrophe resulted.

Disaster came again in 1939-45 when revolutionists with comparatively unlimited objectives were able to use modern military force; in turn, they were countered by the unlimited policy of unconditional surrender. Mulling over the "might-have-beens" of World War II, Osgood finds some things that we should probably have done better. Two of his findings on that era bear on his final conclusions:

1. Total war has proved an exceedingly blunt instrument of national policy and a most difficult one for strategists to control precisely.

2. It is doubtful that even the most skillful and forceful presidential leadership could have modified the prevailing American approach to the war to lead the Nation into the paths of wisdom suggested by the keen-eyed hindsight critics.

Colonel G. A. Lincoln was graduated from the United States Military Academy in 1929 and from Oxford University where he studied as a Rhodes Scholar. He was appointed permanent professor of USMA in 1947, and became head of the Department of Social Sciences in 1954. He was advisor to the Secretary of State at the Paris Peace Conference in 1946 and Deputy to the Under Secretary of the Army in 1948-49. He is coauthor with Lieutenant Colonel Jordan of "Technology and the Changing Nature of General War," which appeared in the May 1957 issue of the MILITARY REVIEW.

Lieutenant Colonel Amos A. Jordan, Jr., is a 1946 graduate of the United States Military Academy and of Oxford University where he studied as a Rhodes Scholar. He served as an instructor in the Department of Social Sciences at the USMA, and as economic advisor to the US Economic Coordinator in Korea. He was appointed permanent professor of the Military Academy in 1955.

His analysis of World War II strategy provides small comfort to those who claim the broad flow of history would have been changed by greater wisdom on a few, currently controversial decisions. In his examination of World War II he undertakes a judgment now and then which is primarily military and, in some cases, debatable. Perhaps the most startling is his statement, based on his reading of the United States Strategic Bombing Survey, that "Allied airpower was decisive in defeating Germany." The author may not realize the implication of his words to professional military men—who are bound to think immediately of such items as the battle of the Atlantic and the Eastern Front, not to mention the Western Front.

American and Communist Approaches

In the chapters on the American and Communist approaches to war, Osgood argues from the political and psychological standpoints and not from the standpoint of military policy and programs. He finds that Americans have been babes in the woods in power politics, continuing into the dangerous mid-20th century their innocence of the 19th century. Rather than supporting a rational relationship of power and policy, with consequent forehanded national planning, they have approached the entire subject with a combination of pacifism and pugnacity—an all-or-nothing attitude conducive to unpreparedness, unlimited war, and dissociation of the factors in the diplomacy-power-policy triangle.

Examining the Communist approach to war, Osgood finds Communists congenial to the dictums of Clausewitz, rational, conscious that diplomacy is a function of power, morally callous, and capable of accepting limited settlements. But his statement that Communists see a natural conflict of interests in international relations whereas Americans see a natural harmony of interests could readily be proved an oversimplification by polling 10 New York taxi drivers. In fact, the book tends to make the Communists "eight feet tall" in their appreciation of the principle of political primacy.

The one serious gap in his analysis of contemporary history is his failure to discuss the considerably less-than-perfect record of the USSR since World War II in managing the force-diplomacy-policy relation. That management caused the seizure of Czechoslovakia to trigger the Marshall Plan, made Berlin a symbol damaging to communism, brought about NATO and other collective security arrangements, and rearmed the United States, both tangibly and spiritually. But this complaint is tangential to the main flow of the analysis of Communist methods which strengthens the case for a strategy of limited war.

The author finds that "Soviet leaders are emotionally and intellectually predisposed to manipulate power cautiously...." and that the US, while more likely to be irrational than the USSR, is showing a heartening maturing of approach to international realities. Consequently, he asserts, the triggering of general war by irrational action or miscalculation by the main antagonists is henceforth unlikely.

Containment

Having concluded by the middle of the book that the US should adopt a policy of limited war, he turns to post-World War II history and finds reinforcing reasons for a strategy of limited war—along with some extraordinary inconsistencies between announced US policies and actual US programs. In practice, it appears that our main plank of national strategy has been and is "containment" in the flexible, dynamic sense. But this nonpacifistic, nonpugnacious concept is as distasteful to Americans as the concept of limited war. Hence we have rarely ad-

mitted to a containment policy, but have loudly planned policies for deterring and fighting total war, and have only improvised policies toward limited war as crises have arisen. Osgood realizes the limitations of containment, specifically the difficulty of applying such a policy in the "gray" areas of Eurasia where there is little awareness of or willingness to meet the threat of Communist expansion, and where there is danger of wasting our national substance in inconclusive, perhaps wholly unsuccessful, attempts to apply limited counterforce. He feels that, given our problem, we must be satisfied with this less-than-perfect solution to our strategic problems. Moreover, he points out persuasively, many of the arguments used against containment are based upon illusions about the relative strengths of the US and USSR positions.

He singles out the Korean war as the most significant event in the development of American postwar strategy. It was, he thinks, handled tolerably well in accordance with the principles of political primacy and economy of force. Our post-Korean attempt to avoid the limitation problem altogether has led us to place major reliance on retaliatory airpower at a time when the credibility of retaliatory threats, against other than all-out attack, has been diminishing. This effort to contain by the threat of retaliation, increasingly interpreted as a threat to turn any limited war situation into a general Armageddon (and hence less and less convincing), will contribute, he believes, to setbacks such as have already occurred in Indochina. This policy is doubly damaging when allies and neutrals view it in comparison with the USSR's "peaceful coexistence" policy.

He concludes that the US is unprepared to deal with the most likely contingencies requiring military power and that the danger is compounded by the relatively few people concerned over the situation. Most of the latter are Army officers and, therefore, although he is kind enough not to say so, suspect because of the general belief that they have a vested interest in limited war strategy.

Asserting that there is no alternative to containment, he defines the problem as one of finding the methods to attain that objective. The methods start with a readiness to oppose aggression with a variety of means under a variety of circumstances. Osgood argues that the chief function of our capacity for total war will be to keep war limited and to strengthen our diplomacy against blackmail. In fact, there is no longer a practical choice between little and big wars. He points out that means for the latter generally cannot be applied to the former. On this point he finds our limited war trousers worse than down; they are almost lacking.

Strategic Needs

Ruthlessly dissecting generally accepted and loudly repeated theses, he holds that the road to a properly adjusted strategy is through things we have failed to consider, and things we now unwisely take for granted. Under the former he stresses that inability to check aggression *locally*, on the ground, greatly increases the probability of having to choose between total war and knuckling under. Under the latter is the dubious thesis that air and sea "mobile striking forces," armed with tactical atomic weapons, often can substitute for ground forces. The entire discussion of tactical atomic weapons at times recalls the elaborate code of the duel in the era when honor was to be satisfied with minimum bloodshed. Whether atomic weapons can be used, while still limiting war, he leaves partially open—depending upon what kind of weapons, where, the strategic stakes, and the psychological climate at the time of use.

There is an arresting discussion of differing applications of strategy by geo-

graphical areas, with the carefully developed view that there will be the greatest difficulty in keeping a war limited in the NATO area. As to the "gray areas" of the rimland of Eurasia, he considers a policy of graduated deterrence so appropriate, and one of "massive retaliation" so inappropriate, that the latter policy should now be publicly renounced. He shows that limits must be placed on geographic extent and on targets, as well as on war objectives, in order to make limited war a strategic possibility.

His final view is that, with informed and responsible leadership, America can complete the fundamental transformation in attitudes toward war and toward the relationship between force and policy needed to meet the requirements of this stormy era. Clausewitz said that "strategy is simple, but is not thereby very easy." Osgood finds modern strategic needs neither simple nor easy, and he thinks such should be told forcefully to the American people.

Kissinger

Kissinger jumps into the nuclear age with his first paragraph and stays there uncompromisingly until the final period. Because US leadership and the US public have focused attention on this book, it is doubly important. The book had the support of two years of discussions at the Council on Foreign Relations by a distinguished group of civilian and military experts with Dr. Kissinger as the study director. Like Osgood, the author analyzes the American people's experience with war, examines the differing approaches of the US and the Communists to the problems of force and diplomacy, develops principles of limited war and tests them against hypothetical challenges in various parts of the world, and sets forth the outlines of an American and allied policy to deal with the Communist challenge.

In putting together the key facts about things nuclear—gleaned from his numerous meetings with the Council on Foreign Relations study group, scientific journals, various official papers, and the press on both sides of the Atlantic—he creates even more of a sense of urgency about the dilemmas he is urging us to face than does Osgood. He goes beyond Osgood, too, in several important respects: He analyzes the nature and effects of nuclear weapons, examines limited *nuclear* war in some detail, explores the prospects for disarmament and arms inspection, inquires into Soviet atomic doctrine, and concludes the volume by suggesting changes in the organization and missions of our Armed Forces.

Essential Problem

Kissinger identifies our essential policy problem as the development of a strategic doctrine which will harmonize power and policy. He views the Soviets' successes in the first half-dozen post-World War II years, in spite of our overwhelming nuclear superiority, as due to our failure to integrate the atom bomb into our thinking, as well as into our arsenals. The first step, he holds, is to think in more limited terms—to rid ourselves of our preoccupation with total war and total peace. As Soviet nuclear capability rises and other powers obtain such weapons, we must define the risks we are prepared to take and the strategic transformations in the power situation we are prepared to resist.

Since the preferred Soviet strategy is for indirect aggression or limited war, and since we have been so preoccupied with the threat of all-out war, the prime danger is that the USSR will overturn the balance of power by successive limited challenges, no one of which seems sufficiently threatening, in view of the risks involved, to be met by counterforce. In this regard Kissinger feels that the Korean war was improperly handled because of our poor

assessment of the risks involved and a consequent reluctance to push our strategic advantages—while still keeping the war limited. Moreover, we failed to draw from our experience the right conclusions about the feasibility and desirability of limited war in the future.

After examining the baleful material, social, and genetic effects which general nuclear war would entail, he concludes that to talk of "purely" military considerations in such a holocaust is nonsense. Victory would be impossible in the sense of one power bloc gaining anything; even in the more limited sense of success in the effective imposition of one power bloc's will upon another's, victory might not be achievable, for the "victorious" power bloc probably would not have enough resources left to occupy and administer the defeated powers. The more likely result would be the postwar domination of the world by powers who had stood aloof from the nuclear exchange.

Total War Strategy

Kissinger examines a number of carefully reasoned hypothetical cases (based on present US-USSR air forces, projected nuclear-powered air forces, and future intermediate range ballistic missile (IRBM) and intercontinental ballistic missile (ICBM) forces) to demonstrate that we now have, and—if we make the necessary effort—can continue in the future to have, strategic air superiority over, or at least parity with, the USSR. Parity does not necessarily require quantitative equality. In describing the efforts we must make to maintain our over-all strategic position, he analyzes three areas (in addition, that is, to keeping abreast or ahead in the technological race): dispersal of our strategic air forces, improvement in civil defense, and the augmentation of anti-submarine forces.

Without drawing its full implications, he develops an argument to show that, since we are now prohibited by our own policy from launching a surprise attack, our all-out war strategy cannot be based on destroying enemy strategic air forces before they can be launched against us. We cannot rationally hope to disarm the enemy since we have rejected the doctrine of preventive war. In short, the only feasible question for total war strategy is a dismal one: "how to avoid defeat?" not "how to win?"

Since our capability for total war is useful only for negative ends—that is, deterring our opponents from launching total war and avoiding defeat if such a deterrent fails—we must search for another way to achieve positive ends. We must find a strategy "which can give an impetus to policy rather than paralyze it." Like Osgood, he turns to limited war for the answer and declares that strategy "can assist policy only by developing a maximum number of stages between total peace (which may mean total surrender) and total war." He recognizes the special military problems presented by limited war and asserts that, in fact, limitation must be a political, not a military, act (which is possible only if we recognize that policy does not end when war begins—to the contrary, that policy is the only thing that can give war its goals). The objective of a limited war cannot be the military one of *crushing* the enemy's will, but the political one of *affecting* his will in such a fashion as to make him accept your (limited) conditions.

Limited War Capability

After deftly disposing of the various arguments usually brought against limited war, he turns to an examination of our capability for fighting limited war. He, too, finds it woefully lacking, noting that the Air Force and Navy not only lack the means but also an appropriate doctrine. In assessing the psychological problems of the American people in facing up

to the risks of, and providing the means for, such a policy, his optimism is even more guarded than Osgood's.

In a long discussion of the subject, he argues that limited nuclear war best utilizes our special skills to an advantage. He develops this by showing that such a strategy enables us to capitalize upon our industrial and technological superiority and upon our generally defensive policy objectives. He argues that not only is limited nuclear war our best strategy, but also that in most cases it is our only feasible strategy—since we dare not concentrate against an enemy with a nuclear capacity and since we cannot stop that enemy with conventional arms unless we concentrate. Limited nuclear war, he insists, requires new, not merely revised, tactics and organization; its best analogy is traditional naval strategy. He singles out positional land warfare and air supremacy doctrines as particularly unsuitable for limited nuclear war. The pursuit and destruction of enemy air forces on home bases following conventional doctrine will bring on the mutual suicide of massive nuclear exchange.

Keeping war limited requires that we prevent the enemy from miscalculating our intentions by keeping him informed, perhaps explicitly, of the limitations we are prepared to observe. Kissinger argues that a limited war with nuclear weapon use is, in fact, more likely to remain limited than one without such weapons. Although he admits that limited nonnuclear forces might be useful in some cases, he undercuts this admission by advocating the use of nuclear weapons whenever the opponent has either nuclear weapons or large manpower masses and by stressing the virtual impossibility of our maintaining forces with dual capacities (that is, forces able to fight with either conventional or nuclear weapons). He does not attempt to buttress this view about dual capacity forces with evidence or argumentation; apparently he feels the proposition is self-evident.

Arms Inspection

Turning to a related subject, Kissinger observes that the very fears and tensions which cause armament races logically preclude disarmament agreements. Although apparently less ambitious than disarmament schemes, arms inspection proposals face the same dilemma of confidence. Furthermore, the nature of modern forces and the pace of technological change are such that disarmament and inspection arrangements (if obtainable) could never be foolproof. Since the penalty for being fooled is national disaster, such arrangements might well increase, rather than decrease, all nations' insecurity.

Kissinger gives no weight to the possible deterrent effect of UN inspection teams on a surprise nuclear ICBM strike against a similarly armed enemy. But, he asserts, agreements of a totally different type—limitations on kinds of targets and sizes of weapons—could be effective if war came, since it would be in the interests of both sides to observe them. Thus by mutual agreement, rear areas, strategic air bases, and cities in the zone of hostilities but 30 miles or more from a military installation could be spared from nuclear attack and no weapon over 500 kilotons could be used, unless the enemy has already used it.

In assessing the impact on allies and uncommitted nations of a strategy of massive retaliation, Kissinger is unequivocal: it erodes alliances and alienates the uncommitted. Relying on our strategic airpower and on local forces in the NATO area that are so weak they can serve only as "trip wires" (but are far larger than necessary for that use) has gravely weakened the Atlantic alliance. The cure to the sense of impotence and impending catastrophe which our misguided strategy has produced is to recreate a sense of

common purpose on the basis of a strategy of local defense, using tactical atomic weapons. Kissinger points out that this strategy will entail sharing our nuclear secrets and weapons with our Atlantic allies. If those allies do not support this strategy by providing the requisite limited war forces, he asserts that we should withdraw the bulk of our forces in Europe and return to a massive retaliation strategy.

Soviet Military Doctrine

In a brilliant discussion of Sino-Soviet strategic and military thought he shows how revolutionists treat compromises and how by "caution, persistence, and ambiguity" the Communists have unfailingly pursued their announced objective of burying the free world. He finds that Communist military doctrine, which is best stated by the Chinese, not the Russians, calls for "protracted limited war" as the best method of achieving political objectives. He stresses that the Communists will always strive to cloak their objectives by presenting their challenges in as ambiguous a fashion as possible, and that if the non-Communist world treats these challenges as legitimate aspirations it will be nibbled to death.

However, he asserts, we can handle an opponent with such a strategy if we seek no conditions "for which one is not willing to fight indefinitely and no advance [is] made except to a point at which one is willing to wait indefinitely. The side which is willing to outwait its opponent—which is less eager for a settlement—can tip the psychological balance, whatever the outcome of the physical battle." Although we have been wrongly conditioned by our historical experience to stand this kind of battle of psychological attrition, Kissinger believes we have no alternative. In another psychological area, initiative of combat commanders, he thinks the US has a clear advantage over the USSR—but one that can be capitalized on best in a limited nuclear war situation where traditional Russian methods and centralization would be penalized.

Change in National Attitude

In describing the tasks we must set ourselves, Kissinger returns to his theme of achieving "a doctrine which will enable us to act purposefully in the face of the challenges which will inevitably confront us." The search for such a doctrine has been inhibited by the existing organization and missions of our Armed Forces, the relative weights given budget and defense considerations, and the present arrangements for congressional participation in defense matters. Among his answers he does not call for complete unification of the services, which he feels is impractical, but for the reorganization of our forces into tactical (or limited war) forces and strategic (or all-out war) forces. The present service distinctions would be retained for administrative and training purposes. He does not, however, expect that organizational remedies can substitute for the really essential change in attitude needed. We have sought certainty where uncertainty is the rule; we have been reluctant to recognize the role of power in foreign affairs; we have viewed peace and war as absolutes. In his final sentence Kissinger declares that our challenge is to demonstrate "that democracy is able to find the moral certainty to act without the support of fanaticism and to run risks without a guarantee of success."

Comparison of Volumes

Besides the already-mentioned differences in scope between the two books, there are important differences of interpretation of the same subject matter. Osgood, for instance, is emphatic that the United States must retain a nonnuclear limited war capacity, whereas Kissinger

slides over this point in his concentration on limited nuclear war. While Osgood feels that there is little prospect that war in the NATO area can be limited (and that NATO is not necessarily doomed for lack of such prospect), Kissinger holds that it is vital to the alliance that the defense strategy in that area be shifted to limited war. Osgood believes that use of tactical nuclear weapons may require an increase in numbers of ground troops and that such weapons are not invariably required against massed manpower. Kissinger apparently holds that the manpower requirements for tactical atomic warfare will be light (he recognizes that the more tactical atomic formations the better, but in failing to provide logistical support for them he makes clear he does not envisage they will be large or numerous).

In all these instances, Osgood's reasoning seems the sounder. Most of the shortcomings in Kissinger's analyses stem from two sources: his implicit assumption that everyone else—particularly the opposing generals and statesmen—is as logical and reasonable as Henry Kissinger and his unrealistic contrasts between modern atomic and conventional tactics in limited wars. In his logical, almost mathematical, pursuit of doctrine, he overrides any misgivings about the political and psychological difficulties of following his prescriptions. His conclusion that either our NATO allies must furnish limited nuclear war forces or we must withdraw the bulk of our forces in Europe is a typical consequence of closing our alternatives by pursuing a "calculus of risks" to its logical end—without leaving any flexibility to meet unforeseen developments.

Kissinger's vision of modern conventional war is obscured perhaps by his specialty as a historian, for he apparently still thinks in terms of World War I or II. In visualizing tactical nuclear warfare as analogous to naval strategy he has missed the points that the enemy must be *forced* (by manpower on the ground) to concentrate in order to provide a suitable atomic target, whereas, except for raiders, naval forces *seek* to concentrate. His unnecessarily magnified distinction between the training and equipment required for the two types of forces leads him to further questionable conclusions about the feasibility of maintaining both kinds of capability in one armed force. His preoccupation with Europe and the Soviet threat it faces leads him to gloss over the strategic problems involved if nonnuclear powers, satellites or not, threaten our vital interests in some area. His conclusion, for example, that the lesson of Suez should have been that powerful, highly mobile forces are required by the West should have included the term "nonnuclear" in the description. Again, his view that 500 kilotons represents an acceptable size weapon for limited nuclear war is questionable (such a weapon would be nearly 30 times as powerful as the weapon which destroyed Hiroshima). Once *any* nuclear weapon is used, the clear ridge line separating the two kinds of weapons has been passed over and there are no other clear lines of demarcation. If the destructive limits thereafter shift to a 500-kiloton magnitude, it will be much harder to observe any weapon limits.

Budget Requirements

Both authors allude to the economic problems of maintaining limited war forces. Osgood, in fact, states forcefully that a larger defense budget, of perhaps 50 billion dollars or more, is required. Kissinger puts the case more obliquely when he says that "budgetary requests are not formulated in the light of strategic doctrine" and that a clear fiscal policy always wins out over a fuzzy national security policy. It would have been useful if both had further considered the problem of financing the forces required for limited

war. Even a cursory look at the increasing costs of our nuclear deterrent in the ICBM age shows that, within a few years, even a 45 or 50 billion-dollar budget may leave little limited war capability. Comptroller W. J. McNeil of the Department of Defense recently said that "for *one* wing of ICBM the total initial capital outlay may reach one billion dollars." Osgood cites a National Planning Association (NPA) study of the ability of the American economy to support defense which should be widely read by those interested in probing deeper into this question than the usual generalities about the need to maintain a "sound national economy." (The NPA answer is in much larger sums that even the largest current estimates of service needs.)

Kissinger has made several of the most essential points needed for a fresh look at defense spending; unfortunately, he has not pulled them together and explained their implications. As noted, he pointed out that we cannot base our all-out war strategy on destroying enemy strategic air forces before they can be launched against us. In other words, deterrence must be based on destruction not disarming. In another context, he observes that relatively few high-yield, maximum fall-out weapons are required to achieve a very high level of destruction. If it is not necessary and, in fact, serves no purpose to maintain the capacity to saturate the USSR with thermonuclear weapons (in pursuit of an outmoded theory of disarming the enemy before he can strike), then perhaps we can hold near-present spending levels on our all-out forces and earmark any increase in funds for limited war forces. At least, such an approach should be investigated in concomitance with the reexamination of defense spending.

It may appear that these reviewers have been unduly harsh on Kissinger whose book has been almost universally applauded without critical comment. Where so much has been attempted there is bound to be room for disagreement, particularly since the author has gone beyond diagnosis to prescribe treatment of problems which our statesmen have not solved. Almost all of his diagnosis and much of his prescriptions are not easily questioned, and even when the analysis bogs down, the reader benefits by being forced to rethink his own beliefs in an attempt to produce a feasible alternative. Professional soldiers who are attempting to reconcile a doctrine of limited war (or graduated deterrence) with a feeling that "in war there is no substitute for victory" should find Kissinger especially challenging. Reservations and criticisms should not hide the probability that, as the President of the Carnegie Institution expresses it, "this is the most important document on foreign affairs in a decade."

Analytical Approach

These two scholars, brilliant and meticulous, have cleared an amazing amount of brush from the new ground on which our security policies must now rest. They also have plowed many useful guide furrows across this ground. Plenty of plowing remains to be done, however, before we have an adequate picture of the security future.

While both authors accept our need for powerful and certain retaliatory nuclear power, they leave to others the analysis of the nature and handling of that retaliatory power which will give greatest stability in case limited military hostilities occur. Such an analysis should be attempted by military officers who are versed in the capabilities of both conventional and nuclear weapons and who are completely nonparochial in their outlook. These analysts might see the rise of entire new weapons systems, the demise of some dearly beloved ones, and a major change in both the offensive-defensive mix and the "political-military" mix. For example,

what constitutes deterrence? When neither opponent desires to risk massive nuclear war because there is no victory from battle, then what and how much is enough to deter? What is the most economical blend of weapons and political arrangements which makes the strategic nuclear equation least unstable?

Both authors' discussions of alliances emphasize, by implication, another area needing public exploration by the best minds. What are the effects of the nuclear factor in relationships among allies and with satellites? A recent widely read book, Nevil Shute's *On the Beach*, has the obliteration of the human race triggered by irresponsible atomic bombing by a satellite state. What are the responsibilities for interalliance restraint? How far should we go in providing nuclear weapons to allies, and what are the alternatives? For a final example (although the reader can provide others) of topics for further analysis, do tactical nuclear weapons really favor the defense? Can they be delivered with any assurance that the launching areas will not be attacked by strategic size weapons?

Conclusion

The voice of scholarship, now that it is belatedly turning to national strategy, appears almost unanimously critical of important aspects of current strategy and military programs, at least as they have been presented to the American people and the world. This pair of trenchant volumes will almost certainly have an influence on both strategy and programs. When today's critics have faded and today's lieutenants have become generals both volumes are likely to have acquired the status of "classics."

Our fortunes are in our own hands. We have the power to save the future. But we must approach it with moral fervor and determination, with courage and the will to sacrifice. The difficulties and dangers which beset us today cannot be removed by closing our eyes to them. They will not be mitigated by inertia—waiting to see what happens. Nor will they be remedied by surrender to expediency. There is no easy road to peace, and there never has been.

The American people wisely recognize this immutable fact, and they are devoting themselves with unremitting zeal to the maintenance of strong military forces as the indispensable pillars of peace. Two world wars and the Korean conflict have taught us how tragic is the price of unpreparedness. We will never again be led down the primrose path of wishful thinking. We have in our united defense team—our splendid Army, Navy, and Air Force—the most powerful deterrent to war the world has ever seen. The Armed Forces of the United States stand today as the mighty bulwark of our Nation against the onslaught of a tyranny which would destroy everything we hold dear.

Secretary of the Army Wilber M. Brucker

ANTIAIRCRAFT DEFENSE

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THE degree of reliance on deterrence, diversion, and destruction—the principal methods for prevention of attack of any type—has varied continually with the type of attack concerned and the means available to deal with it. Against the centuries of military development which have gone into moving death through the air, decades only have been devoted to active defense against airborne objects. A brief review of the history of the air defense problem may, perhaps, bring into better perspective the current and future decisions to be made.

Past Performance

First, consider changes in the capability of the attacker. In World War I, bomber speeds were about 100 and fighter speeds 140 miles an hour. Bombers carried about one-half ton of high explosive; fighters packed machineguns. By World War II, speeds of both types of aircraft had doubled, and bomber load capacity had increased 20 times, while fighters also carried bombs as well as heavier firepower. Then, in the summer of 1944, the *V-1* arrived, a pulse-jet pilotless aircraft carrier of high explosive. Next followed the *V-2*, a true missile with a speed of almost 3,500 miles an hour. At about the same time, jet and rocket aircraft announced the imminent passing of piston-engine bombers and fighters as military weapons. Finally, in August 1945 came Hiroshima and Nagasaki. The destructive power which could be moved by a single air carrier had increased 40,000 times and the carrier speed 35 times. The death of a city *could* move almost 58 miles per minute.

But no nation quickly combined carrier speed and range with destructive power. Until 1949 the United States alone had atomic weapons. Now the world's major air forces have converted to jets with speeds ranging from some 600 miles an hour for bombers to over 900 for fighters, both able to carry atomic weapons. Short-range (200 miles or less) guided missiles capable of carrying atomic warheads have been reported in production since 1956.

On the defensive side, weapons in World War I included the same fighters as those used for attack, machineguns fired from the ground, and 75-mm artillery. Control and adjustment of ground fire was visual. World War II fighters had better speed, range, and armament; antiaircraft (AA) machineguns were heavier, had higher rates of fire, and improved visual fire control systems; guns had increased in caliber so that the main US weapon was the 90-mm; and radar eliminated the need for visual contact with a target to allow gun laying.

Fighters now can intercept with rockets armed with homing devices aimed at targets located by short-range radar carried

We live and will fight any future general war under continuous pressure of hostile atomic stockpiles. AA defense against atomic strikes must be based on instantaneous fire decision and an effective control system

aboard. Added to multiple ground machine-guns is the *Skysweeper*, an automatic 75-mm gun with a rate of fire over 40 rounds per minute and automatic target acquisition and tracking ability. A new fire control system has improved effectiveness of 90-mm guns.

Nike-Ajax, a guided missile with a range of about 25 miles and speed of 1,500 miles an hour—according to unofficial news reports—has been in operation for several years. *Nike-Hercules* has been reported about to go into position in the United States. Again, unofficial news reports give the *Hercules* a range between 50 and 100 miles, and the capability of carrying an atomic warhead.

Although warning of aircraft attack in World War I was visual or by sound, radar extended the range and all-weather warning capability in World War II. Later radar improvements have further increased the range, accuracy, and coverage which can be obtained from any given site; radar sites have been established in the Arctic, along the western edge of the Iron Curtain, and in other places throughout the world. Ship and airborne radar pickets and "Texas Towers" expand coverage outward from the United States.

Colonel Walter M. Vann was graduated from the United States Military Academy in 1939. He attended the 13th General Staff Course of the U. S. Army Command and General Staff College in 1943; the Armed Forces Staff College, 1952; and the Army War College, 1955-56. During World War II he served in Europe with G4 Headquarters, 12th Army Group. Other assignments include duty in G4 Plans of Headquarters, US Forces, European Theater and European Command; G4, Department of the Army; AAA Battalion Commander and G3 Executive at the Antiaircraft Artillery Guided Missile Center, Fort Bliss, Texas; G3 Plans of United States Army, Europe; Assistant Deputy Chief of Staff for Operations, Headquarters, USAREUR; and Commander of the 1st AAA Group in Seventh Army. He was assigned to the faculty of the USA CGSC in July 1956.

Air Defense System

The history of these defensive means has been one of joint Army-Air Force action. The defense system has been based on early warning to permit interception at long range by fighters which were to reduce, if they could not eliminate, the strength of the attack. At the tiny cores of the defense was the antiaircraft artillery to destroy attackers who had eluded or penetrated the fighter defense.

Through World War II to the present this basic system was used both in the United States and in theaters of operation, while antiaircraft ranges increased and the time available for fighter interception decreased. The system carried within itself a problem which was a source of anxiety to both Army and Air Force and complicated the procedures used to control fighters and antiaircraft. Although aircraft may be detected at considerable range, certainty of identification is almost impossible. If an aircraft is fired on before it is definitely known to be hostile, an American or allied aircrew and an expensive aircraft may be destroyed. If fire is withheld until an aircraft is definitely determined to be hostile, hundreds, thousands, or even hundreds of thousands of people may be destroyed. In this situation the decision to fire and the type of weapon employed is critical.

This problem is easier to analyze at present if the areas in which it arises are taken separately. To begin with, the United States was never threatened by air attack on a scale which would affect her existence or full prosecution of a war until after 1949. It is not the purpose here to debate intentions of the USSR, but she does have long-range jet bombers in large numbers, atomic weapons, and often has declared unfriendly sentiments toward the United States. Thus if we accept unofficial published reports, the United States is threatened to a degree by a fleet of approximately 500 to 1,000 strategic bombers

which could carry an undetermined number of atomic or thermonuclear bombs. Some of these might be free-falling, while others could be guided missiles with possibly 100 miles range. If even 10 percent of these bombers delivered atomic or thermonuclear weapons on cities, the casualties would be measured by something like tens of millions.

Air Defense Problems

Defense has long been designed to develop and reduce the strength of the attack, to locate the main effort, and to concentrate force to meet and defeat the main effort. However, if 500 aircraft, each capable of carrying an atomic weapon, attack on a 1,000-mile front, where is the main effort? Any one of them has the potential capability of destroying a major population center or a major element of the war capability of the United States. Each aircraft becomes a separate main attack from the viewpoint of the defended areas which each is capable of reaching.

Defensively, there is a cushion of space to help in the problem. Warning time for aircraft attack should amount to hours, and engagement space to hundreds of miles. A substantial proportion of any attack detected by the early warning screen should be destroyed by fighters before the attack approaches antiaircraft defended areas.

At that point the situation becomes critical. When unidentified aircraft come within the range of antiaircraft defenses in the United States, they are at the point where further penetration is intolerable. Their continued movement into the protected area must be stopped. At this point the effort must be directed to making absolutely sure that *every* potentially hostile aircraft *and* its bomb load are destroyed. Guided missile defenses are acknowledged to be effective enough against medium and high-level attack below saturation strength to make the chances of survival of any single aircraft small, even if high-explosive warheads are used on the missiles. But there still is a chance of successful attack. The risk of even a small number of aircraft or a single one over the bomb release line seems to dictate the use of atomic warheads on missiles whenever the attack aircraft are high enough for the burst not to endanger personnel on the ground. High-explosive heads obviously would be used down to the minimum limits of fire of weapons.

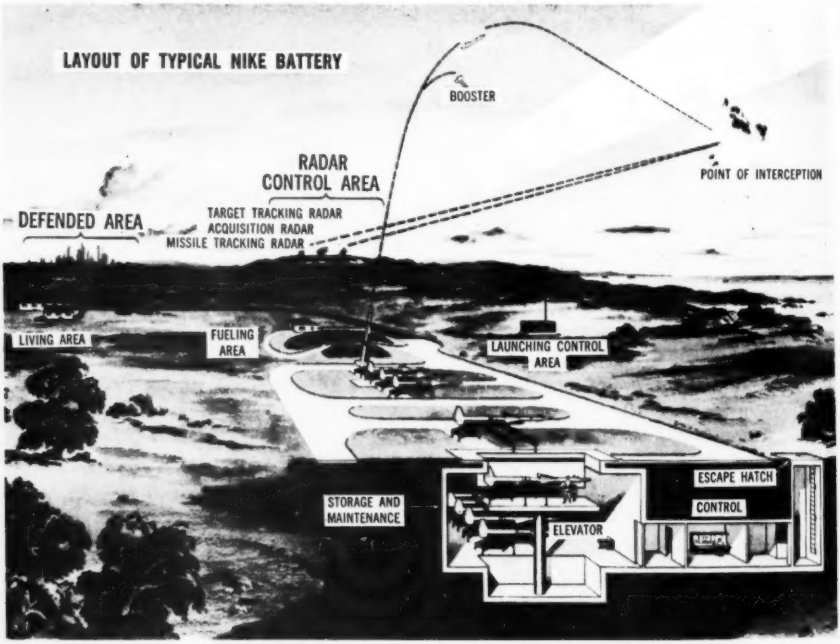
After an aircraft enters effective range of the antiaircraft defense, the determination of when and how to fire (including the warhead to be used) must be made by someone whose decision can be effective with zero delay. As between risk to friendly aircraft and certainty of destruction of unidentified, the entire priority must be given the latter, even though the probability of the former may approach 100 percent because of the weapon selected.

In substance, when unidentified aircraft approach the United States, there is an initial zone after detection—varying in depth according to the length of warning and distance of detection point from AA defended areas—in which air-to-air attack and tactical maneuver is possible and necessary. This zone ends for each defended area at the extreme range of its antiaircraft defenses. Here, tactical maneuver of defense forces ends, and maneuver of fires alone is feasible. Beginning at extreme AA range, there is another group of zones in which air targets are allocated to antiaircraft fire units according to strength of attack in each sector of the defense. This target allocation must be made by the time aircraft enter effective antiaircraft range. Like the aircraft defense zone, these outer AA zones have an inner limit. Aircraft passing inside that limit must be engaged by the fire unit which can place a weapon on target most rapidly, with engagement responsibility determined strictly by the sector in which the aircraft is located at any given time.

Immediate Decisions Required

It is unnecessary to draw the limits of each of the engagement zones described here. Accepting unofficial news reports that the range of *Nike-Ajax* is around 25 miles, that its time of flight to that range is around one minute, and that in one minute an attacking aircraft can cover between 10 and 15 miles, it is obvious that the entire antiaircraft defense must be based on immediate fire decisions instantaneously transmitted and executed. Decisions of this type can be made and executed only by an individual observing a limited area on a radar screen with authority to bring fire on any target entering that area. There is a corresponding need for surveying the entire defended area in order to direct the fires of units which have no targets in their areas of responsibility to other areas in which there is a danger of defense saturation. In essence, there must be one man with final responsibility and authority over each sector of an antiaircraft defended area.

What type of antiaircraft control system is required in order to accomplish this? The AA control system required is one in which:



Courtesy, Western Electric Company

1. Identification must be simultaneous with detection, if detection is not made until a target is within antiaircraft range.

2. Antiaircraft is completely free to fire on an unidentified target which enters its range.

3. Friendly aircraft without means of positive identification cannot enter an AA defended area except at their own risk.

4. Even aircraft identified as friendly still risk being destroyed if they enter an AA defended area close enough to unidentified aircraft to be inside the effects radius of any weapon which might be used against these aircraft.

It appears from the foregoing discussion that air defense of the United States will continue to require the use of both defensive aircraft and antiaircraft units until missiles replace aircraft as the main offensive threat. Under such air defense conditions, a joint commander is necessary to provide positive coordination of the two defense means and to ensure that warning is provided to both. Unity of command is justified by a need for unity of effort, which in turn arises from the necessity to get the most effective use of all available means for a single purpose.

Field Army Air Defense

Compared with the United States, the entire area of a field army is a single antiaircraft defense, rather than a connected group of defenses such as exist in the northeast industrial center of the United States. A field army is exposed 24 hours a day to ground fires of all types as well as to an enemy air threat. The air threat includes fighters and bombers; even a liaison aircraft may be the target spotter for atomic artillery or missile units.

Warning in a field army is limited to the time which can be provided by early warning radar located somewhere *behind* the front. No cushion of time and space is available to a field army in which defensive aircraft can reduce attacking strength, since there is no engagement area in which fighters obtain sufficient warning to operate before an air attack enters the antiaircraft defended area. *Offensive* air operations may reduce the strength of enemy air forces which can be used against the field army, but once the attack is airborne, warning and fighters are not available in the correct relationship for effective *defensive* action by aircraft. This is true not only for the front portion of the army area, but throughout its entire depth.

A hostile fighter at very low altitude crossing the frontline before detection at 750 miles an hour would cover 50 miles in four minutes. *Skysweepers* or 90-mm guns located within 6,000 yards behind the front, however, could bring the aircraft under fire within the first eight seconds after penetration. This assumes, of course, that there is no identification delay. Each half-minute of delay will allow the aircraft to penetrate an additional *11,000 yards*. The result, in the case of Seventh Army, was that General Alfred M. Gruenther, in March 1956, told newsmen that "an attacking aircraft could be 80 miles inside the frontier before it was intercepted by a fighter plane. . . ." Fighters in this situation have become practically useless for air defense of a field army.

As an additional problem factor, the rate of use of airspace over a field army by friendly aircraft is higher than would be the case at the time of an attack in the United States, where time is available to take emergency measures to clear the air of all except friendly combat aircraft. Unless positive control and identification of all craft in the air over a field army is effective, unidentified or hostile aircraft will not be discovered until detected visually. In the field army, then, air traffic control, positive identification means, and air defense are inextricably linked. There also is a need for every aircraft to have continuous communication with air traffic control over the area in order to receive instantaneous warning of the presence of unidentified aircraft.

Two-Area System Needed

If no effective fighter defense of the field army is possible, it must be accepted that the same situation holds for the airbases immediately in rear of the army, insofar as air attack passing through the

field army is concerned. The 360-degree engagement area for fighters around the United States has a vacant sector in a theater of operations which is filled by field army antiaircraft. There is still, however, a great need for fighter defense of the approaches to the communications zone around the flanks and to the rear of the field armies. Here the problem closely resembles that in the United States and can be handled in a similar manner. This situation requires a two-area system, with exchange of warning instantaneously and continuously between areas, separate air traffic and fire control within each of the areas, and interarea movement only with clearance by the receiving area. The commander of the field army's system must have overriding authority for targets in range of his weapons over any other air defense commander, and he must have ability and authority to control all air traffic over his area.

It is important to realize that due to a restriction on the area of effectiveness of one of the means, this duality of areas exists in a theater of operations *because of a limitation on defense capabilities.* This situation need not cause damage to the security of the field army or the area to its rear. Both the Army and Air Force are dedicated to the common purpose of serving the best interests of the United States regardless of the procedural complications and modifications of generalized rules which may be necessary.

Conclusion

In a war in which atomic weapons were not used initially, the United States might be forced to attempt the destruction of any atomic weapons so placed that their use against US forces appeared imminent. Lacking proof of presence of the weapons, there still would be a strong compulsion to destroy weapons delivery capability whenever such capability was brought near enough to the United States forces to constitute a threat to survival. This could mean that "air superiority" would change its meaning for the soldier in the field army. Relatively certain destruction of aircraft would make continued attempts to use them for harassment, or for any purposes less than strategic ones, unlikely, unless they come to be considered expendable in support of ground operations.

The United States lives, and will fight any future general war, under the continuous pressure of hostile atomic stockpiles. Her war organization and tactics are conditioned by this threat. It is logical to assume that atomic strikes against both the United States proper and her field armies will begin with no previous announcement of intentions. The approach of any carrier capable of delivering an atomic strike could reasonably be considered to be the initiation of an atomic attack until proved otherwise. Since the only proof to the contrary would be ex post facto, the carrier must be treated as an actual atomic attack. This seems to demand that the United States plan to use atomic weapons, if necessary, against any unidentified aircraft to ensure that an atomic strike is not delivered. General war plans based solely on conventional weapons is to take a position similar to the one customarily associated with the ostrich.

MOVING?

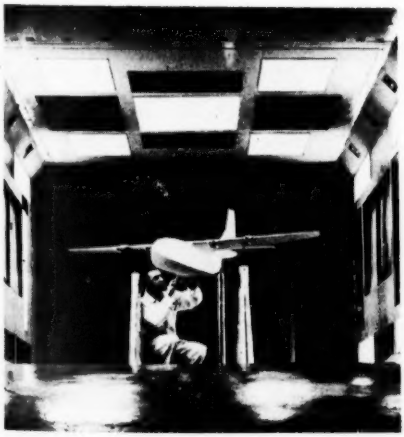
If you are moving, please notify the MILITARY REVIEW, Fort Leavenworth, Kansas, of your change of address. Be sure to include your name, *old* address, and *new* address.

MILITARY NOTES AROUND THE WORLD

UNITED STATES

All-Purpose Low-Cost Plane

The *M-253 Turboboxcar*, now in the design stage, is an all-purpose cargo and troop transport. It is planned as a low-cost plane for military use in assault re-

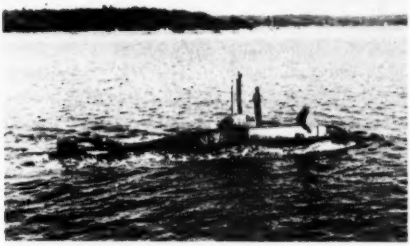


Wind tunnel test model of *M-253*

supply and logistics operations. It will be able to carry more than 30,000 pounds of cargo at short ranges and more than 10 tons at normal range of 1,500 miles. Cruise speed will be about 250 miles an hour at 25,000 feet altitude. In later configurations using boundary layer control, the *M-253* will be capable of extremely short takeoff and landing performance.—Commercial source.

Midget Submarine

The Navy's first midget submarine, the *X-1* (MR, Apr 1956, p 66), has completed preliminary water trials and has been turned over to the Navy for tactical evaluation tests. The 50-foot-long submersible weighs approximately 25 tons and is manned by a crew of four men. Although the normal mission of the midget craft originally was planned to be the testing of harbor defenses, it also has been re-

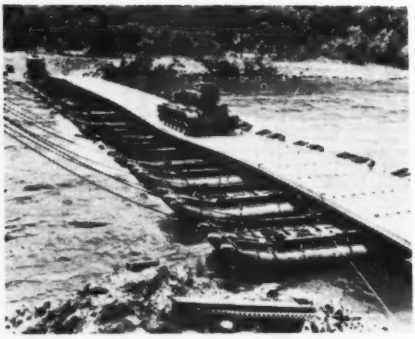


Four-man submarine, *X-1*

ported to be a promising weapon for close-in attacks upon harbor installations, shipping, and other vital underwater demolition functions.—Commercial source.

Lightweight Floating Bridge

The *M4T6* floating bridge now in use by both the United States Army and Marines is completely hand-erectable and can



US Army Photograph

***M4T6* 60-ton capacity floating bridge**

support loads up to 60 tons. All components of the bridge are air transportable —the heaviest single package being the 750-pound neoprene-coated nylon floats. Two of the pneumatic half-floats are joined together to form a complete float unit and are used as the support for the bridge at 15-foot intervals along its length.

The road surface consists of hollow aluminum alloy deck sections weighing 225 pounds each and placed side by side in a staggered position. Steel beams and plywood panels are used to provide stiffness and distribute the load to the floats. Trained crews can erect the bridge manually at the rate of 1½ feet per minute. —Official release.

Turbulent Flight Simulator

A *Jumping Jack* device that simulates turbulent flight conditions is in use by the Air Research and Development Command to test the effect of aircraft buffeting on humans. The huge machine, which consists of an aircraft type seat mounted on a 30-foot elevator mechanism, bounces a man up and down at 19 miles an hour on an 18-foot path. At maximum travel a rider of this apparatus will feel a pull of 2½ times that of gravity. The rapid repetition of opposite vertical motions is expected to give the same buffeting as present-day aircraft in actual flight in rough weather conditions. The device also will be used to study stresses on a pilot using ejection seats and emergency escape capsules.—Official release.

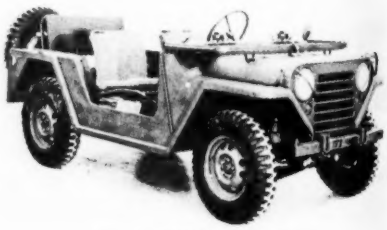
Atomic Antisubmarine Weapons

It has been revealed that *F2F Guardian* antisubmarine aircraft of the United States Atlantic Fleet are armed with atomic depth charges. The nuclear weapons, which are nicknamed *Betty*, were tested about two years ago in the Pacific. It is reported also that the Navy is developing a ship-based atomic antisubmarine weapon to be called the *Lulu*.—News item.

Transportation Developments

Recent developments in transportation matériel include a new jeep; an eight-wheel, 10-ton truck; a pneumatic roller type troop and cargo carrier; and a rough terrain forklift.

The ¼-ton utility truck, 4 by 4, *XM 151E1*, due to its lightweight, good riding



Army's lightweight jeep

qualities, and steering and handling ease, is expected to become a replacement for the present *M38A1* jeep. It is 440 pounds

lighter, six inches shorter, and three inches lower than the *M38A1*, and has a four-speed transmission and unitized body and frame.

The 10-ton, 8 by 8, cargo truck *XM-409* utilizes many components common to the

10-ton tactical cargo truck

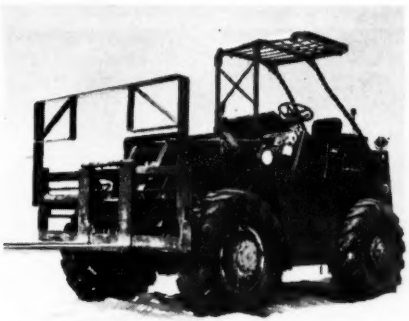
five-ton, 6 by 6, *M-55* truck. It has demonstrated outstanding performance in tests and recorded a drawbar reading of 11,500 pounds in towing another vehicle in 26 inches of snow. In addition to its capabilities as a high-capacity cargo carrier, it is expected to find wide application in the ground support of various missile systems.

The pneumatic roller type cargo and personnel carrier, *XM-401*, is under test.

Pneumatic roller special-purpose carrier

Using the rolligon axial-drive principle, the *XM-401* weighs 13,000 pounds and will be used as a special-purpose vehicle for moving large tonnages over adverse terrain such as marsh, swamp, sand, and snow.

The rough terrain forklift is made in two models, one of three-ton and the other of five-ton capacity. Both models can move readily through surf and up to



US Army Photograph

Versatile rough terrain forklift

five feet of water to unload landing craft and transfer supplies to inland storage points. They can traverse sand, snow, and virtually all types of difficult terrain that is inaccessible to conventional materials handling equipment.—Official release.

Closed Cycle Gas Turbine

A closed cycle gas turbine is under test in experiments to determine the basis for design of a mobile, gas-cooled nuclear powerplant for military applications. The regenerating system will operate with nitrogen as the working fluid. An oil-fired heater will be substituted for an atomic reactor as the heat source in initial tests. The nitrogen is heated to over 1,000 degrees Fahrenheit in the heater and expanded through a two-stage axial flow turbine. The turbine, in turn, acts to drive a two-stage centrifugal flow nitrogen compressor and an electrical generator which produces electric power. The system is now in the design and component development stage.—Official release.

Wide-Tread Landing Gear

A wide-tread main landing gear has been developed for use on the *C-123* assault-logistics transport and the *M-253 Turbo-boxcar*. The design, which features a

Old and new type landing gear

wider tire mounted on a canted axle rigidly supported in its attachment to the airframe, provides improved weight distribution, gives the pilot better control of the aircraft while on the ground, permits shorter takeoffs and landings, and is easier to service and maintain. In a test of landings and takeoffs using a landing field of deeply rutted sand, the wider landing gear has shown a distinct improvement over the present standard.—Commercial source.

Correspondence Course Offered

In addition to the regular 10-month Resident Course, and the yearly series of National Resources Conferences offered in the past by the Industrial College of the Armed Forces, a Correspondence Course has been added for those members of the military services who cannot attend the Resident Course. The extension course, "Emergency Management of the National Economy," is being offered to Regular and Reserve officers, National Guard officers, and to civilian executives in industry and government. The objective of the Correspondence Course is to emphasize the all-importance of civilian-military relationship, and to explain the interdependence of the many subject areas which have an important bearing on economic readiness. A certificate of completion is awarded by the Industrial College of the Armed Forces to every student who successfully completes the course.—Official release.

Protection for Tractor Driver

Successful tests have been completed of a special cab which protects the operator of a bulldozer tractor from radiations

US Army Photograph

Cab protects driver from radioactivity

while working in a contaminated area. Made of lead and weighing 5,000 pounds, the cab will permit early cleanup of radioactive areas. The cab accommodates the operator, the tractor controls, a radio, and special radiation meters that record the amount of radioactivity in the area. With the aid of a crane, three men can mount the cab on a tractor in 30 minutes. Lead

glass windows on each of the four sides provide visibility for the operator. The cab is pressurized with fresh, filtered air.—Official release.

Gas Turbine Helicopter

Flight tests of the *H-21* helicopter equipped with the *T-58* gas turbine engine (MR, Oct 1956, p 66) indicate it will

Turbine-powered *H-21D* helicopter

more than fulfill performance specifications. The *T-58*, which weighs only 267 pounds, produces 1,050 horsepower and consumes fuel at a rate that compares favorably with reciprocating engines. It is 55 inches long and 16 inches in diameter. Other helicopters now being tested with the *T-58* as their powerplant include the *S-58* single rotor aircraft in which a dual installation of the *T-58* has made several unofficial test runs.—News item.

Conversion to Metric System

All United States weapons and related equipment are to be converted to the use of the meter for measurement of linear distances. The objectives of this change are to establish a common unit of measurement in connection with the operation of all Army weapons, to facilitate standardization within NATO, and to permit better and more extensive use of allied and captured material. Since the military grid of all maps in use by the Army are measured in meters, firing procedures for indirect fire weapons also will be simplified. This change does not include the use of the metric system in measuring weights and fluids, and does not change the units of measurement used for expressing meteorological data for the Army. The conversion to metric measurements of linear distances is to be accomplished over a 10-year period, and will be fully implemented by 1 January 1966.—News item.

'Talos' Launching System

The Navy's long-range surface-to-air guided missile *Talos* (MR, Oct 1957, p 62) is handled by a complex loading and launching system that weighs more than 350 tons. The system not only stores, loads, trains, elevates, and launches the *Talos*, but also automatically selects the type of

Official US Navy Photograph

Talos launcher

missile the fire control officer chooses and delivers it to the launching station. The *Talos* can deliver either a high-explosive or atomic warhead, and can be used against enemy ships or shore bombardment targets, as well as in its primary role of air defense.—Official release.

Marines Reorganize

The 1st Marine Division is being trimmed down to make the assault elements helicopter transportable, and the entire division air transportable. This includes the elimination of the 45-vehicle tank battalion, and an increase in the reconnaissance elements. The Marine Corps' two other divisions and three air wings will follow suit. The new division will retain the traditional triangular structure, with the exception of battalion level where the organization will be "square." The results of this change will be a reduction in division strength to 1,045 officers and 17,865 enlisted men—or about 10 percent. The 150-man reconnaissance company has been redesignated a reconnaissance battalion with a strength of 489. The heaviest mechanized antitank weapon in the reorganized division will be the *Ontos* (MR, Jan 1957, p 67) which is light enough to be air-dropped.—News item.

Naval Plans

With the scheduled deactivation of the 57,450-ton *Iowa*, the last of the battleships will be removed from service with the operational fleet. Additions to the fleet during Fiscal Year 1958 are expected to be 10 converted and 23 newly constructed vessels. Conversions planned for completion before June 1958 are: seaplane tender *Albermarle*; guided missile light cruiser *Galveston*; attack carrier *Midway;* and radar picket escort vessels *Blair, Sturtevant, Newell, Thomas J. Gray, Ramsden,* and *Mills.* New commissions are expected to include: attack carrier *Ranger;* destroyers *Jonas Ingram, Dupont, Bigelow,* and *Hull*; escort vessels *Bridget, Hooper,* and *Taussig*; coastal mine hunter *Bittern*; ocean minesweepers *Sturdy, Swerve,* and *Venture*; nuclear submarine *Grayback*; three tank landing ships; two utility landing craft; and one mineplanter.—News item.

GREENLAND

Experimental Ice Cave

An experimental 1,000-foot tunnel in the thick Greenland icecap is large enough to accommodate a narrow-gauge electric railway. The cave is 200 feet deep in the ice, and the temperature within it never varies from 14 degrees Fahrenheit. It is lined with flat-topped chambers used as laboratories. Many tests are being conducted including a determination of the feasibility of using ice caves for storage. —News item.

JAPAN

Subchaser Joins Fleet

The Japanese Navy's *Misago* is one of eight subchasers built under the 1954 naval construction program. These 339-ton vessels have attained a speed of 21 knots on test runs. They are armed with a dual-mount 40-mm antiaircraft gun. For antisubmarine operations they have a hedgehog, two *Y* guns, and depth charges. Radar antennas are mounted on a tripod mast, the funnel being offset to the port side of the vessel.—News item.

SWITZERLAND

1958 Defense Budget

The Swiss defense budget for 1958 will be 206 million dollars, about 43 million more than was spent in 1957. The increased expenditure is planned for use in raising military pay, and to purchase land for an armored vehicle training area.—News item.

UNITED NATIONS

Technical Assistance Pledge

Seventy-five nations have pledged over 30 million dollars for United Nations technical assistance during 1958. This represents an increase of 600,000 dollars over 1957. The United States pledged 15.5 million dollars, the same amount as contributed for 1957.—News item.

STRENGTH OF ARMED FORCES OF WEST AND EAST GERMANY

FEDERAL REPUBLIC		EAST GERMANY	
Population	50 million	Population	17.8 million
Bundeswehr (Federal Armed Forces)	100,000	*Nationale Volksarmee* (National Peoples Army)	110,000
Bereitschaftspolizei (Police Groups)	11,000	*Bereitschaftspolizei* (Police Groups)	20,000
Bundesgrenzschutz (Frontier Protection Force)	10,000	*Grenzpolizei* (Frontier Police Force)	40,000
Transportpolizei (Transport Police)	None	*Transportpolizei* (Transport Police)	8,000
Kampfgruppen (Defense Groups)	None	*Betriebskampfgruppen* (Workers' Defense Groups)	215,000
Total Under Arms	121,000	Total Under Arms	393,000

Press and Information Office, German Federal Republic

ITALY

'Centauro' Class Frigates

The *Centauro* class frigate, *Cigno*, is equipped with two geared steam turbines of 11,000 horsepower each, and can reach a speed of 26 knots. Vessels of this class are armed with four 3-inch and four 40-mm antiaircraft guns, two sets of 18-inch torpedo tubes, and a twin-barrel antisubmarine mortar forward. The 3-inch guns are mounted in two-story gun turrets fore and aft. The *Cigno* has what is said to be the highest foremast of any vessel of her size afloat. Other warships of the 1,475-ton *Centauro* class are the *Canopo*, *Castore*, and the *Centauro*.—News item.

Naval Fleet Additions

Twenty 125-ton, shallow-water minesweepers have been completed and delivered to the Italian Navy during the past year. The *Sandalo*, the seventh and last of the 375-ton *Bambu* class coastal minesweepers built in Italian shipyards, has joined the fleet. Minesweepers of the Italian Fleet are: four oceangoing 700-ton vessels; 37 AMS and 17 YMS type sweepers; and 20 shallow-water types. Four fast corvettes of 1,400 tons each are under construction, and a submarine to be named the *Guglielmo Marconi* is included in construction plans. Destroyers of the *Impetuoso* class, the *Indomito* and the *Impetuoso*, planned for commission in 1957 displace 3,800 tons, and can attain a maximum speed of 34 knots. They are armed with four heavy antiaircraft guns in twin mounts, five dual-mount 40-mm guns, a triple long-range *Menon* antisubmarine mortar forward, and four *Menon* depth charges aft.—News item.

Swept-Wing Trainer

The *G 91T* aircraft is a training version of the *G 91*, a light tactical fighter (MR, Feb 1957, p 70), now under test by NATO authorities. The *G 91T*, a two-seat plane capable of performing military missions within the operational field of its fighter counterpart, uses a *Bristol Orpheus 4* turbojet engine of 4,500 pounds thrust. The swept-wing trainer is capable of speeds in excess of 600 miles an hour and weighs 11,000 pounds.—Commercial release.

GREAT BRITAIN

Airliner Improvement

The *Comet 4B*, most recent development of the *Comet* line of aircraft, carries 99 passengers at a cruising speed of 545 miles

***Comet's* jet noise suppressors**

an hour. The *RA-29* engines of the *Comet* aircraft, which are comparatively quiet in operation, have been fitted with special noise suppressors which still further reduce the jet blast noise made by the 10,500-pound thrust engines of the airliner. —News item.

Folding Tail Helicopter

Great Britain's version of the United States *S-58* helicopter is called the *Westland Wessex*. Prototype models have been equipped with a 1,100-horsepower *Gazelle* free-turbine engine. Production models will have a more powerful 1,450-horsepower engine. The engine is mounted at an angle in the nose of the aircraft and drives the main rotor through an inclined shaft. For shipboard use the length of the *Wessex* can be reduced by about 10 feet by folding the tail section forward. All controls and the drive shaft are coupled and uncoupled automatically during this operation. The main rotor blades also fold. Production models will carry 100-gallon drop tanks for long-range operation.

In tests the *Wessex* was airborne within 60 seconds after the engine starter button was pushed. Fully loaded, the helicopter

Photograph copyright "The Aeroplane"
***Westland Wessex* helicopter**

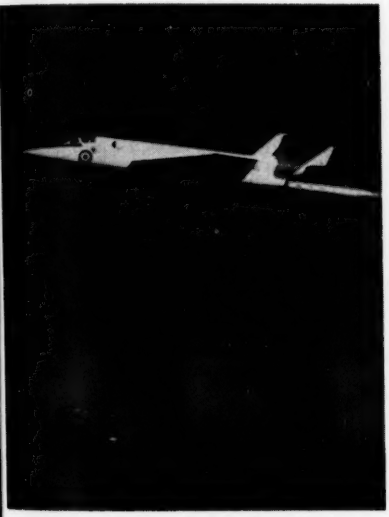
weighs a little over six tons with a 2,200-pound payload. Its maximum speed is 120 knots with a normal cruising range of 390 miles.—News item.

Mixed Unit Interceptor

The *S-R. 53* combination jet- and rocket-powered interceptor (MR, Sep 1957, p 69) is able to operate with comparative economy whether the radar warning that sends it into action is short or long. In long early warning cases the aircraft can cruise toward the target on the economical power of its turbojet, switching to its rocket motor and jet reheat to accelerate to high supersonic speed for the attack. When warning is short, the high speed attained by its throttable jet motor is used to climb to the necessary heights at rocket speed.

A larger development of the *S-R. 53*, designated the *S-R. 177*, is powered by a *Gyron Junior* turbojet and a variable-

thrust *Spectre* rocket. The speed of the *S-R. 177*, several prototypes of which have been built, is expected to be above Mach 2. Described as a missile with a human monitor, the aircraft is fitted with an autopilot and automatic interception control,



S-R.53 **mixed unit interceptor**

and is armed with *Firestreak* missiles mounted on its wingtips. It is able to operate from comparatively short runways and tactical airstrips.—News item.

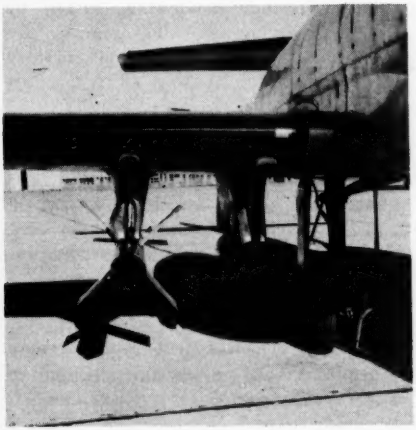
CANADA

Utility Transport

The *DHC-4 Caribou*, the first prototype of which is expected to be flying by mid-1958, is described as an all-weather utility transport. The twin-engine *Caribou* features a wide H-shape tail, and will be able to utilize extremely short runways, requiring only 450 feet of takeoff run to reach flying speed. With a maximum load of almost four tons, the aircraft can provide seats for 28 combat troops. It also will be built in an ambulance version for carrying 22 litter cases. Five *Caribou* aircraft have been ordered for the United States Army, with delivery scheduled to commence early in 1959.—News item.

Missile Program Dropped

Canada's *Velvet Glove* air-to-air missile project has been phased into the modification of the United States *Sparrow* air-to-



Velvet Glove **in aircraft mounting**

air missile for the Canadian Air Force, and work on the Canadian-designed and built missile has ceased. Over 300 test vehicles for the *Velvet Glove* project were manufactured and fired during the four years the program was in force. The project is said to have been of major importance in the training of personnel and the development of Canadian facilities for research, testing, and evaluation of guided missiles.—Official release.

BULGARIA

Helicopter Tested

A Bulgarian-designed and constructed helicopter, the *LAZ-10H*, has completed its first test flights. The *LAZ-10H* is a lightweight, two-place aircraft with a two-blade rotor driven by pulse-jet engines. —News item.

USSR

Record Claimed

The Soviet helicopter *MI-6* is claimed to have set a world's record for helicopter weight-lifting by raising a 26,400-pound payload to an altitude of 8,000 feet. The *MI-6*, which appears to be an enlarged version of the *MI-4 Hound*, is equipped with a five-blade main rotor driven by two turbine engines. The engines are mounted on top of the cabin just forward of the main rotor housing. It is reported that the big rotor craft will seat from 70 to 80 passengers.—News item.

Soviet Flying Platform

According to a Soviet periodical, a ducted-fan flying platform is under consideration for use for military observation and reconnaissance. It resembles a similar type device under development for the United States Armed Forces (MR, Jul 1955, p 64). The Soviet model uses four ducted fans that enable the machine to rise vertically and hover.—News item.

'Meteo' Rocket

The *Meteo* rocket is being used by the Soviets in International Geophysical Year research in Antarctica to secure information on air temperatures and densities up to an altitude of 56 miles. The *Meteo* features a hollow booster, and two great rectangular parachutes each 690 square feet in area. Including its booster the rocket weighs a ton, is 29 feet long, and is fired from a mobile tower. Both the main rocket liquid propellant motor and the solid propellant booster are fired at the same time, the blast of the main rocket motor going through the center of the hollow booster. The fuel used by the main rocket motor is aviation kerosene and nitric acid which ignite when combined.

The booster burns out and drops off after two seconds. The main rocket burns for a full minute. At an altitude of about 44 miles small rockets ignite in the base of the nose cone, separating it from the main rocket and pushing it on up to the maximum altitude. Both the main rocket body and the nose cone are parachuted back to earth for possible reuse. The nose cone carries four cameras and radio telemetering equipment. A larger research rocket in use by the Soviets is claimed to be able to reach an altitude of 125 miles. —News item.

Fast Climber

Russia's transonic *MiG-19 Farmer* twin-jet interceptor has an exceptionally high rate of climb, and is able to reach an altitude of 50,000 feet in about three minutes. The *Farmer* is nearly 44 feet long and has a wingspread of about 33 feet. The wing has an extreme sweepback of 58 degrees, with wing fences at the half-span points. The unusually large horizontal tail surface is located low on the fuselage. Powered by two axial flow gas turbine engines with afterburners, the *Farmer* has a calculated maximum speed of Mach 1.37 at an altitude of 36,000 feet. Its takeoff weight is nearly 10 tons, and it requires a little less than 2,500 feet of runway space to take off, and 2,100 feet to land.—News item.

Airline Progress

The Soviet's turboprop airliner, *Rossiya*, is claimed to be able to carry 180 passengers nonstop from Moscow to New York at a speed of 550 miles an hour. Two other turboprop aircraft, the *Ukraina* and the *Moskva*, in addition to the *Rossiya*, are scheduled for use by Aeroflot, the Soviet national airline.

The *AN-10 Ukraina* is a four-engine, 84-passenger plane that cruises at 342 miles an hour at an altitude of 26,000 feet. Operated by a crew of five, the high-wing turboprop is designed as a cargo carrier as well as a transport, carrying 3.5 tons of cargo in addition to its normal passenger load. Its four *Kuznetsov* turbo-

prop engines develop 4,000 horsepower each. Features of the aircraft include a cockpit for the navigator, a feature of all the newer Soviet transports, and a vertical stabilizer which extends well below the fuselage. The *Ukraina* weighs 57 tons at takeoff and carries a 27,720-pound payload. It is capable of a maximum speed of nearly 400 miles an hour, and is claimed to be able to operate from sod fields and with only three engines if necessary.

Three all-jet aircraft, the *TU-104*, *TU-104A*, and *TU-110* are already assigned to Aeroflot, which claims to cover 230,000 miles of airline routes. The *TU-104A*, which uses *AM-3* engines, has a large tourist compartment with 54 seats in a five-abreast arrangement. Two smaller eight-passenger rooms are provided for first-class passengers. The *TU-104* is reported to have carried an 11-ton load at an average speed of 605 miles an hour in a 1,000-kilometer (621 miles) closed circuit test. Maximum speed reached during the flight was 637 miles an hour.—News item.

FRANCE

High-Aspect Wing Aircraft

The *HDM.105*, a twin-engine aircraft that features a high-aspect wing and triple tailfins, is under study for possible military usage. The *HDM.105*, which is the product of a French-English firm, has completed initial test flights in England and will be further tested in the Flight Test Center at Bretigny, France. The six-passenger aircraft can take off with a run of only 175 yards.—News item.

'Caravelle' in Production

The revolutionary *S.E.210 Caravelle* airliner is in production for Air France, Scandinavian Airlines, and Brazil's Varig Airline. Deliveries are expected to begin in October 1958. Initial production will be at the rate of one aircraft per week, with a rate of seven per week planned for 1960. The *Caravelle*, which cruises at 470 miles an hour, is equipped with seats that fold up against the cabin walls for the conversion of the aircraft to a cargo-carrying role. The swept-wing, medium-range, 80-passenger airliner mounts its two *R.A. 29* axial flow turbojet engines (10,500 pounds thrust each) in nacelles on each side of the rear fuselage just ahead of the tail unit. This unique placement of powerplant mounts also has been adopted for use in the British *Vickers 1000* airliner and the American *Sabreliner* and *Jetstar*. The fuselage mounting of engines is said to increase safety, reduce noise and vibration, and make the powerplants easily accessible for servicing. —News item.

SPAIN

Airbase Opens

A base operating unit of about 1,000 men has been transferred from Getafe airport, south of Madrid, to the new 62 million-dollar airbase at Torrejon, 15 miles northeast of Madrid. The United States Sixteenth Air Force, which has been using the Getafe installation jointly with the Spanish Air Force, will base its strategic jet bombers at Torrejon where a runway 13,400 feet long has been constructed. Taxiways and parking ramps for supersonic fighter aircraft also are available at the big base. The Spanish Air Force is planned for operation from the Torrejon installation, utilizing *F-86F* interceptors. The new base is equipped with 30 high-speed refueling hydrants, each capable of pumping 600 gallons per minute. Other developments of the Spanish defense network include the use of the Saragossa base by *B-47* medium jet bombers and *KC-97* tankers. Aerial tankers also have landed at the Seville Municipal Airport at San Pablo where a supply depot is under construction. A fourth major base construction project is in progress at Moron in the south of Spain.—News item.

FOREIGN MILITARY DIGESTS

The Graduated Deterrent

Digested by the MILITARY REVIEW from an article by Colonel K. Mackay in the "Australian Army Journal" April 1957.

The atomic bomb with all its terrors did not carry us outside the scope of human control or manageable events in thought or action, in peace or war . . . with the hydrogen bomb, the entire foundation of human affairs was revolutionized and mankind placed in a situation both measureless and laden with doom.

Sir Winston Churchill, The House of Commons, 1 March 1955

SINCE the statement quoted above was made, the governments of both America and the United Kingdom have continued a policy of developing atomic weapons and hydrogen bombs, and the armed forces of both countries have been, or are about to be, equipped with an array of these weapons when they are suitable for operational use. Both governments have implied that aggression will be met by massive retaliation in one form or another involving the use of these new weapons. The Soviet Union has a nuclear capability and also has implied the use of nuclear weapons in retaliation.

There is no doubt that a great deal has been accomplished in the last five or six years in the field of nuclear weapons and the means of delivering them. It also seems clear that much more progress, if progress is the right word, will be made in the next few years. The intermediate range ballistic missile (1,500 miles) and the intercontinental ballistic missile of about 5,000 miles' range no doubt will be developed in the near future. The first atom bomb was exploded in August 1945 and the first hydrogen bomb in 1952. Compared with the development of more orthodox explosives, the development of nuclear weapons has been fantastically fast. Perhaps it has been too fast for the world to comprehend.

The Problem

Whether we like it or not we live in a thermonuclear age. A stage has been reached which has been referred to as

thermonuclear stalemate. While vague statements have been made by some heads of governments, no policy regarding the circumstances under which these latest weapons will be used has been stated. This creates an atmosphere of great uncertainty which helps to make the weapon an effective deterrent.

Many prominent people are of the opinion that during this stalemate there will be no global war. However, this does not rule out limited wars, cold wars, or armed conflict such as Suez. As things stand at the moment, is a world power like the United States or the United Kingdom prepared to risk global war and massive destruction over a relatively minor issue which is not vital?

Insofar as the Western World is concerned, it would appear that if the governments arm their services with nuclear weapons and do not contemplate national suicide, then separately, and preferably collectively, some clear governmental policy is required dealing with the circumstances under which these weapons will, or may, be used.

Scientists and physicists have shown that three, and certainly not more than 10, large-size hydrogen bombs dropped on the British Isles will almost certainly destroy life there as it exists today. Similar figures of no great magnitude have been produced to deal with the heart of both the Soviet Union and the United States. In brief, this is the massive deterrent threat that exists now and produces a stalemate in conditions of global war.

A situation has been reached where few thinking people feel that wholesale destruction of an unprecedented magnitude would be a sensible solution to another Korea, for example. While global or total war might be ruled out for the time being, there still arises the question of what should be done to deter and, if possible, prevent all lesser forms of war. Basically, this is the problem to be resolved.

Graduated Deterrent Concept

It would appear that a solution could be in some form of graduated deterrent which, after all, is a part of our way of life. At any school the "bully" is discredited, and a young boy soon learns that if he must fight he should scrap with someone his own size. In civil law it is basic that only sufficient force should be used in self-defense, and, of course, service officers are all too familiar with the stringent rules concerning aid to civil power. Even on an international scale the graduated concept is not new at all.

Briefly, the idea of "graduated deterrents" is to graduate the size of the nuclear weapons used to the size of the aggression. It implies using only sufficient forces in a limited area to deter the aggression. Or, on an arithmetical scale, it means to an aggressor that if you hurt me or my friends to the degree of four, then I will retaliate to the degree of five, and so on up the scale. In this way it should be possible to ensure that aggression, to whatever degree it is contemplated, will not be profitable and is, therefore, less likely to be attempted.

The concept sounds delightfully simple but it is deceptively difficult. On closer examination, political, moral, and strategic implications of the greatest magnitude quickly emerge. While many prominent and distinguished men with a wide variety of backgrounds have spent a great deal of time on this question, it would appear that up to now not one has been able to think the problem through to a logical or acceptable solution.

The Massive Threat

While it is conceded that we live in a thermonuclear age, and that weapons of mass destruction are available to both sides, some disagree with the graduated deterrent concept. Their attitude is that the moment we speak of a graduated deterrent we show the Russians that we have

a fear of using the ultimate weapon; that there should be no compromise at all, and that Russia should be left in no doubt that if she begins any form of aggression the retaliation will be both massive and immediate. It would appear that this minority group is losing ground fast, and probably will come around to the view that, in the final analysis, a defense policy based on national suicide is not very promising for the future.

Worldwide Factors

The problem of a graduated deterrent policy is not simply a question of evolving a national policy, although it might well begin on that level. Clearly, the issue has worldwide implications, and to be effective even a national policy must at least take into account the probable attitude of neighboring and like-minded nations, if that is possible. It is not a question of a policy suitable for the United States and Great Britain who now have nuclear capability as against Russia. The countries of Europe are much more than interested spectators.

It has been suggested, and it could well be correct, that if it became necessary for the Strategic Air Command to destroy the Russian nuclear establishments in the Lake Baikal area, the resulting primary and secondary fallout due to prevailing winds might destroy life as it exists today in the Indian subcontinent. It is well-known that if war must be waged, it is most undesirable that it be conducted in your own backyard, and that no country seeks to be the scene of battle. Relatively underdeveloped areas which could be a target for Communist aggression might think twice about seeking aid involving nuclear weapons which could bring retaliation and great destruction. This problem affects the entire world, and political and moral considerations, at least initially, are likely to be the major ones.

Fission or Fusion?

Every thinking person has a stake in the solution of this problem—assuming a workable solution is not beyond the ingenuity of man. When a problem seems to be too big to grasp a shortcut or easy way out might be attempted. Before going further it might be a good idea to rule out some of the temptations. One might spring from Sir Winston Churchill's quotation at the beginning of this article; and in fact many people have advocated banning the hydrogen bomb completely.

Unfortunately there is no such thing and no such easy demarcation line. Low-yield fission weapons have been produced from a small infantry weapon of about two- to 500-kiloton bombs. Fusion weapons can be produced in the three-deck form of fission-fusion-fission up to 60 megatons or they can be scaled down to about 100 kilotons.

The lower-yield, small kiloton weapons may be clean, that is, with negligible radiation, or dirty. No doubt the smaller weapons will be made smaller, but there seems to be no point whatever in going beyond 60 megatons, which is about 3,000 times more powerful than the Hiroshima nominal bomb of 20 kilotons. To the layman, fission and fusion do not mean much any more. It is now more a question of what effect, measured roughly in either kilotons or megatons, is required, and it can be tailormade.

Conventional Forces

As time goes on it will become more difficult to draw a distinction between conventional and unconventional forces, not that it is easy to make the distinction clearly today. As nuclear weapons are taken into service they become an integral part of the defensive or offensive capability of the forces. Defense costs are such in money and manpower that Russia cannot be matched in armed manpower alone, but she can be matched by the West in defensive and offensive capability—only

with nuclear weapons. The old rifle and bayonet element is decreasing, and this process will no doubt continue.

A state almost has been reached now when the main striking power of the armed forces of the major nations is based on nuclear weapons, and if hostilities begin on any scale they would have to be used because the forces would be armed and trained to fight with these weapons.

Before considering moral issues or tactical and strategical implications it would seem that the entire problem of a workable policy for graduated deterrents is extremely difficult and that there is no easy answer. This, of course, is proved by the fact that no politician of international repute has offered a solution. In fact, they have been remarkably quiet on the subject, yet many realize only too well that sooner or later they will be required to decide on a policy. It is rather significant that so little has been written and said about what is a very important and current problem.

Nonnuclear Countries

While it might be unwise to generalize, it would seem that a majority of countries that have no nuclear capability and no intention of developing it are inclined to favor banning nuclear weapons of all types or drastically limiting them. Those countries pursuing a neutral policy, except perhaps Sweden, can be expected to favor disarmament and banning. Many of the less developed countries have offered no views at all, and might be expected to go along with the tide and see what happens. Very few countries, and they are NATO nations, seek to obtain or be associated in over-all defense plans involving nuclear weapons.

Russia has used threats in connection with nuclear weapons, and her intention seems clear. It would be reasonable to expect the lead on this question to be taken individually or collectively by the United States and Great Britain, but they are likely to be opposed no matter what they say or want by most other nations, and, on principle by the USSR.

Public Opinion

It is quite clear that any national policy on the graduated deterrent would be a governmental decision. Apart from taking into account aspects of worldwide significance, some of which have already been mentioned, the government would require the backing of public opinion and military advice on the application of a policy. As great moral issues are involved, public opinion is likely to be a major factor.

At present the general public in the United Kingdom has been told very little on this subject, and has had little opportunity to form an opinion. It is probable that a similar situation exists in the United States. Religious leaders, educators, and moralists are likely to influence a large proportion of people in both countries. To date the main theme is humanitarian. It would be well to have a working knowledge of their point of view.

The Hague Convention of 1907, the Geneva Protocol of 1925, and the Geneva Convention of 1929, which were preceded by earlier declarations and conventions, imposed certain rights and agreements which should not be violated by belligerents during hostilities, and protected to some degree both civilians and combatants. At Nürnberg after World War II, both the Western Powers and the Soviets realized that some of the crimes against humanity attributed to Germany stemmed from the Nazi concept of total war. The trouble is that global, total, or world war tends to disregard both the limitations of the conventions mentioned above and the considerations of humanity.

The introduction of nuclear weapons worsens this trend, and many people consider that the use of megaton weapons is not only illegal but morally indefensible and quite unthinkable. Naturally, this concern and fear go right down the scale of

nuclear weapons, since to their way of thinking even the smallest of the kiloton weapons is likely to cause unnecessary destruction to both civilians and combatants alike.

Religious Leaders

The second assembly of the World Council of Churches (the Evanston Report, 1954) named two conditions of crucial importance which must be met if catastrophe is to be avoided:

1. The prohibition of all weapons of mass destruction, including atom and hydrogen bombs, with provision for international inspection and control such as would safeguard the security of all nations, together with the drastic reduction of all other armaments.

2. The certain assurance that no country will engage in or support aggressive or subversive acts in other countries.

These are indeed crucial points, but it might be reasonable to suggest that they represent a major goal toward the ideal of the total abolition of war itself.

The pacifists very briefly reject all manner of armed force, and seek to resist evil by methods which do not employ violence. This makes aggression just too easy. As far as can be judged, churchmen, moralists, and educators, who would be supported by a large section of the community, appear to be realists in the sense that they recognize the danger of easy aggression and accept nuclear weapons as a fact. In these circumstances the graduated deterrent idea at least represents a step in the direction of the goal mentioned earlier.

Military Considerations

There has never been international agreement on what exactly constitutes strategical and tactical aims or objectives —not that the distinction matters a great deal today. The graduated deterrent concept aims at restricting and limiting a possible area of conflict with the object of restoring the *status quo* or getting a cease-fire as soon as possible.

If the suggested arithmetical scaled application of the graduated deterrent is to be effective, the conflict need not reach such proportions that strategical targets should be attacked. However, such targets cannot be ruled out, although the implication is that the area of conflict would be wide and the scale would be on the order of a large-size limited war with the grave risk of becoming larger, not smaller.

In these circumstances it might be desirable to restrict consideration to what might be more properly termed tactical objectives or targets. Such targets would be those directly affecting the area of conflict of the ground forces involved, or the area of immediate aggression. In an era of great mobility these targets might be 500 or as much as 1,000 miles from the battlefront, if, indeed, there is one. It is clear that some geographical limit is desirable but the distance must be flexible to meet possible contingencies on a worldwide basis.

The tactical area will be very difficult to define and limit, and because of wider implications this is more likely to be a political than a military matter. Inside the tactical area a policy will be required for the conduct of the resistance to the aggression committed. It will also be necessary to decide on a scale and priority of tactical targets to be attacked and the size and type of weapon to be used. Few military targets are likely to be isolated from some civil community, and in fact the more important targets are likely to be close to centers of population. Attacks on such targets using even small kiloton weapons are indiscriminate to a degree that civilian casualties are likely.

It would seem that centers of civilian population should be spared, yet vital military targets such as airfields might be in or close to large cities and towns. From this reason it is evident that a degree of

political direction and control is necessary and desirable in the tactical sphere, otherwise the military commander would be placed in an intolerable position.

The Paradox

It seems a paradox to spend a great deal of time and thought on how to conduct war with the object of preventing war. Yet a policy for the use of the deterrent must indicate how force will be used in the hope that it will prevent war from beginning.

One can but hope, without being unduly optimistic, since it is clear that there are many irreconcilable factors in the international and humanitarian field, internally with public opinion on moral issues, and also from the tactical point of view.

Suggestions

With a problem as complex and difficult as this, one is tempted to admit it is just too hard for the present, and hope that some answer will emerge some time. For what they are worth, the following suggestions are offered:

1. Megaton and kiloton weapons and the means of delivery are possessed by the West and Russia. Further development of these weapons is certain, and in due course more nations will have nuclear capacity, therefore, some control or policy for their use on an international scale is required.

2. It will not be possible to devise rules for the use of thermonuclear weapons on an international scale which have any hope of being workable and acceptable. At present there is no supranational authority capable of handling the problem with any hope of success. The major Western Powers must take the first decisions individually or collectively, yet whatever is decided must have a reasonable chance of success from their point of view.

3. The idea of the graduated deterrent offers the best line of approach, even though it may not be anything like a complete answer to the problem and may take some time to evolve.

4. The Western policy should take the form of a brief indication of intention and should not be unduly limited or expressed in detail. There should be political certainty that nuclear weapons will be used to a degree that will ensure that aggression is unprofitable, but there should be some uncertainty as to the size, area, and circumstances under which they will be used.

5. The Western policy might be in the form of a blunt statement of intention to preserve peace by stopping aggression on the part of Russia or the Communist satellites. There seems to be little point in discussing it with the Soviet Union, and less in expecting her agreement. No reliance should be placed on her honoring any such agreement if one were reached.

6. At the top end of the deterrent scale it would be desirable for both the governments of the United States and Great Britain to have megaton capability and the means of delivery on an intercontinental scale. This implies that massive aggression on the part of Russia will be met by massive retaliation. Politically, this intention should be made quite clear to Russia in spite of the danger of national suicide. Major aggression would be too easy if the West renounced the major weapons. In the final analysis it might be pointed out to Russia that in global war there is a degree of certainty that she could be destroyed, and that some of the democracies, because of their geographical spread, would survive.

7. While cities and large centers of population should be spared as far as possible, there should be no limit or guarantee that strategic targets of military importance, even in the heart of Russia, should not be attacked with high-yield weapons if such targets are linked with the form and scale of aggression.

8. While warning of attack may be given

in some circumstances to reduce civilian casualties, no such warning should be given if it involves risk to the means of delivery or to the allied forces.

9. In the tactical field the aim should be to limit the area of conflict geographically, but to no fixed mileage from the point of aggression. The area must be large enough to include sufficient military priority targets for the retaliation to match or exceed the initial aggression in weight of attack.

The aim should be to restore the *status quo* as soon as possible or obtain a quick cease-fire, and in these circumstances weapons in the kiloton range should be adequate. In any event the geographical limit should be large enough to permit attack on part of the homeland of the aggressor.

10. The policy should be such that the commander of the forces engaged retains freedom of action and the element of surprise to act in the best interests of those forces. He should certainly have complete freedom of action for the immediate protection and safety of his forces. It would be intolerable if the commander's hands were tied by predetermined political directions that might not be appropriate, or if he were forced to refer to political authority for decisions in the tactical battle.

Conclusion

Whatever policy is ultimately decided, if it is to succeed it must both reduce to a minimum the danger of a local conflict developing into global war, and ensure that effective and practical deterrents are provided against aggressions. To achieve this, it is not enough that its technical details should be studied by military and government circles, but, in addition, its broad implications must be understood by the general public.

Radio Communications in Modern War

Digested by the MILITARY REVIEW from an article by Guards Major M. F. Vassiliev in "An Cosantóir" (Ireland) March 1957.

FOR some time considerable attention has been directed toward the development of radio communications in the army of the Soviet Union. The interest in radio communication has its origin in the fact that the basic principle governing Soviet armed forces' organization implies a certain freedom of maneuver for units and formations of the Soviet Army. It long has been realized that various elements of the army often might have to operate at very great distances from their parent forces in order to carry out tasks delegated to them. This probable role for its units and formations highlights the importance of radio in the Soviet armed forces. In fact, radio has become so important that eventually all commanders, from the most junior noncommissioned officers to the most senior officers, have been required to have a knowledge of its technical aspects.

Today, radio is playing an increasingly important role in modern war. From its infant days of 1918 it developed beyond all recognition until during World War II it had become indispensable as a communications agency in waging war, both from the strategic and the tactical points of view.

In any study made of the major operations of the Second World War, certain features forcibly emerge. First of all there was the development of motorization which made possible the rapid concentration of armies at decisive points. Then there was the development of the tank which, with its firepower, armored protection, and mobility, changed the entire concept of bat-

tle. Finally, there was the evolution of airpower which was capable of giving close support to attacking ground forces while at the same time striking hard at airfields and industrial installations deep in the enemy's rear. Actions were no longer confined to the battlefield dimensions of World War I for not only did they now encompass greater space on land, but they were reaching far into the sky.

Over all this was radio, surmounting the limitations of time and space and stretching far out to unite the many separate operations being conducted throughout the immense battle area. In actual fact it might well be said that, due to radio, the army communications service has become the third element in battle, after fire and movement.

The advent and subsequent development of this new factor in modern war has had far-reaching consequences. Man's inventive resources during the centuries following the invention of gunpowder were concentrated largely on increasing firepower and on making this increased firepower effective at the greatest possible ranges. In this period the great military minds of the world studied the principle of mobility with interest, and sought ways and means of making armies more mobile. Now, thanks to radio, there has emerged a new aspect of war, namely "wave war." This "wave war" is a singular peculiarity of the last great world conflict.

How important are radio waves in the conduct of war? Generally speaking, they permit the rapid transmission of intelligence, facilitate the efficient and speedy issue of orders, make possible the remote control of weapons, and coordinate the transfer of troops and the conduct of combat operations.

"Listening" Service

Due to their unilateral propagation, radio waves are extremely vulnerable to "listening" by the enemy with a consequent uncovering of their point of origin. The Soviet military minds appreciated this, but their efforts to organize such a service do not appear to have been imbued with any degree of enthusiasm until after the Battle of Stalingrad, when they had the opportunity to become acquainted with the technical details of a similar service organized in the army of Marshal Friedrich von Paulus. This "listening" service of Von Paulus was most successful during its period of operations. While the headlong advance deep into Russian territory was taking place, the Soviet frontline headquarters learned, through prisoners of war and deserters, that the Germans were informed on all aspects of Soviet tactical planning. That Von Paulus was able to take successful countermeasures primarily was due to an efficient and ever-watchful "listening" service, though it must be mentioned that the Soviets contributed in no small way to their own predicament by culpable incaution.

Wave War

Generally speaking, wave war can be either *passive* or *active*.

In the *passive* form the more important tasks include the intercepting of secret messages transmitted over the air, and the locating of the enemy's transmitting installations. These activities will force the enemy to adopt certain measures in order to ensure the security of his transmissions. They will force him to conceal the location of his installations by various means, to change his cipher and code systems at intervals, and to shorten the duration of transmissions as much as possible.

In its *active* form "wave war" involves a struggle for supremacy in the ether, for the highest degree of security for our own radio communications, and, in addition, the organization of every effort to hinder and interfere with the enemy's radio communications system. Greater security can

be attained by an improvement in the directivity of the antenna by an increase in the sensitivity of the receiver, by perfection of frequency control, and, finally, by the acquisition of additional scientific data on the subject of wave propagation.

Detection

In both the Soviet and German Armies in World War II, the wavelengths most used were those lying between two and eight megacycles (150-40 meters). This is roughly a shortwave band, which, because of its particular propagation, is audible first on the ground nearby, and then again at a very great distance away after its return to earth. On this basis it is possible to channel the reception of enemy transmissions into a few central "listening" and detection stations. If these stations are of modern design and equipped accordingly, they can encompass the enemy's radio communications system throughout the entire area of operations.

According to Soviet Army agencies, Great Britain had such an organization during World War II when four or five central stations, working unceasingly, operated more than 7,000 radio receivers.

All statistical data relating to enemy radio transmissions was subjected to processing in listening and detection stations. A careful study also was made of all data received concerning the standard of training and the state of development of the enemy's radio communications service, as well as the quality of his equipments and the frequencies and call signs used by him. This study quite frequently revealed the entire structure of the enemy's radio network, his command technique, his projected troop movements, and even the contents of his operation orders.

The importance of rigid security measures to combat an ever-alert enemy *cannot* be overstressed; to demonstrate the consequences of incaution I will quote but one example: The Germans discovered during the course of World War II that, thanks to the tropospherical refraction of ultra-shortwaves (in the lower atmosphere), it would be possible to direct the bombing of London with *V-1* projectiles from the Continent. That they did, in fact, succeed in doing this is known to us all.

During one of these bombings an incautious message transmitted by the London police force on metric waves of low energy, giving the locations of the points at which the *V-1* projectiles were falling, was intercepted by a German "listening" station operating in Norway. The significance of this is obvious.

Both the Russians and the Germans had discovered the existence of many difficulties militating against the timely transmission of information received concerning enemy plans to interested frontline units. As a result, during the second phase of the war, they both organized special "listening" sections close to the front. These sections were disposed in the immediate proximity to the battle area where they were in a position to make on-the-spot evaluation of information received, and pass the results on to interested units for action. The data collected and processed by these sections was mostly of tactical significance and generally included information on tank force dispositions, and forecasts of artillery preparations and activities indicating the probability of an enemy advance or withdrawal.

The Germans made great use of these sections, as, for example, in the Kurland section of the Eastern Front, when, because of a well-organized "listening" service, they were always extremely well-informed on Soviet Army plans, and consequently were always in a position to counter any attempts by the Russians to mount offensive operations.

"Listening" services were *not*, however, infallible. On occasions, information of an erroneous nature was purposely transmitted by the enemy. As an example, I

might mention Operation *Overlord*, where intensive radio traffic was developed on the British coast opposite Calais to provide a camouflage for the real operation. This led the Germans to believe that the invasion would take place at Calais, and consequently a large force was maintained in that area to meet the expected attack. Accordingly, this force was prevented from taking any part in the decisive battle which later developed in Normandy.

Strategy

During World War II both the Russians and the Germans organized "listening" services with the fundamental task of uncovering the military secrets of the opposing side. This resulted in each side making an intensive study of the waves used by the other, and, at the same time, seeking to drive the enemy's radio transmissions right out of the ether by means of technical improvements. Toward this end, considerable importance was attached to the development of special laboratories for experimentation in the field of radio including the organization of radio meteorology and frequency allocation.

Meteorology

For some time prior to the start of World War II, the study of the regularity of wave propagation in the upper atmosphere was being followed with interest in both the Soviet and German Armies. The aim was to obtain suitable frequencies for radio communications over long distances.

The failure of various Soviet air operations due to bad communications forced the headquarters staff to form a special ionosphere department while the German Air Force established a similar staff section for the same reason.

The peculiarities of the ionosphere (various high strata of the atmosphere, lying between 50 and 350 miles above the ground) and its significance in the propagation of radio waves were studied toward the end of the war by 44 allied observer stations. The Germans had organized only 12 such stations scattered in a ring from Norway to Sicily, and from Melun (France) to the Crimea. These were inadequate to maintain communications with the German submarines operating in the various seas.

In this respect, the Japanese could have been of valuable assistance to their allies, but *not once* during the entire course of the war did they make known to the Germans the results obtained from their observation stations in the Pacific. In fact, the German naval command was forced to send a submarine equipped as an observer station to the Far East, but it failed completely to attain its objective.

Generally speaking, both the Russians and the Germans attained considerable success in the development of their meteorological services. Their efforts enormously increased the reliability of radio communications for long-distance flights and for naval forces operating under and on the water. On land, the problem of radio communications over great distances, so vital to commanders at higher levels, finally was solved. From the naval point of view, in particular, reliable communications over long distances were of considerable importance in setting up the mass torpedoing of convoys.

The development of scientific research in the realm of radio meteorology was continued in the postwar period. The strides made in the United States in this respect show, at a glance, the significance of the upper strata of the atmosphere from a military point of view.

River Crossing in Atomic War

Translated and digested by the MILITARY REVIEW from an article by Colonel P. de Lesquen in "Revue du Génie Militaire" (France) 3d Quarter 1956.

BECAUSE of the difficulties they impose on the movements of armies, great river obstacles have always created a compartmentation of the terrain which has had a marked effect on the art of war. The armed forces of today are forced to carry with them a great amount of bulky bridging equipment; therefore, the art of war is influenced increasingly by the presence of great rivers. In some cases they even set the tone of the operation.

In a so-called conventional war the crossing of a large river poses tactical and technical problems whose solution requires an extensive deployment of means in a relatively narrow zone. The transport always demands a great number of trucks and trailers whose silhouette and manner of loading risk the betrayal of the intentions of the commander. That is why all possible measures for maintaining secrecy are employed and why it is better to operate at night or under the cover of smokescreens. Whatever one does, however, a considerable accumulation of means in a relatively small area always is inevitable.

In a conventional war, concealing and protecting this concentration of means is one of the greatest difficulties in the successful conduct of a river crossing operation. The recent appearance of the atomic weapon makes it possible to destroy any such assembly of men and matériel in a single blow, even though they are dispersed over many square miles.

Up to the present, to destroy a bridge it was necessary to get a direct hit, and there was a considerable risk to attacking aircraft because important bridges were strongly defended. Hereafter, an atomic explosion can bring about destruction in such a zone that a direct hit no longer will be indispensable. It will be enough to secure a near hit which could be possible at night or through a smokescreen.

This makes military bridges particularly vulnerable because even though they cannot be located exactly, a study of the river obstacles and bridging areas permits one to limit the zones or areas where it is technically possible to construct them. Therefore, not only does the conventional process of deliberate river crossing become obsolete in atomic war, but maintenance of bridges over large rivers far in the rear of the combat zone becomes questionable. The lines of communication which are so necessary to armies risk constant interruption.

In the specialized field of river crossing operations, as in all the art of war, it is necessary to reconsider the problem completely. A new solution must be found to the problems of river crossing based on mobility and dispersion imposed by the atomic weapon in the tactical framework of tomorrow.

Atomic Effects

It is known that nuclear weapons can be employed by air bursts, at an optimum altitude according to the power of the weapon, or by ground bursts. This power permits a continuing scale, varying from some thousands up to millions of tons of TNT. The types generally accepted as a basis for studies are the 20-kiloton bomb (Hiroshima type) and the hydrogen bomb of 1,000 kilotons and larger.

For an air burst, the radius of effect of the first type bomb is on the order of a few miles at most, whereas the second type may be tens of miles. For a ground burst the diameter of the crater created by the 20-kiloton weapons can be as great as hundreds of yards, whereas those for the second type can reach and surpass a

mile. Accordingly, one is able to say that although the effect of a weapon bursting in the ground is locally tremendous and results in complete destruction of everything which exists, it takes place in a zone smaller than that which an air burst will create.

Having made this first approximation, however crude, it is now possible to detail the various possible atomic weapons effects against bridges and crossing means in general.

It is known that these effects manifest themselves in heat, blast, and radiation.

The effect of heat is particularly intense, but extremely brief. It is sufficient to destroy wooden or plywood materials in a relatively small radius. For engineer bridging equipment, this effect does not seem to be very dangerous at some distance and most of the time only the paint will be affected.

Blast effect acts in inverse ratio to the weight and strength of materials. It has practically no effect on masonry and reinforced concrete bridges whose dead weight is considerable. Its effect is greater on a steel or iron bridge, the majority of which rests only on supports. Such a bridge will suffer, at most, a little deformation without serious effect on its stability. Such damage will be of little consequence and easily repaired.

On the other hand, the effect of blast is considerable against light crossing means such as floating bridges. The entire assembly can be torn apart completely and the more fragile parts—for example, pontons—run the risk of being destroyed, deformed, or otherwise rendered useless.

Furthermore, to the blast effect must be added the wave created in the liquid mass itself which is capable of inflicting violent damage to anything which floats. It can be deduced, also, that blast effect is less destructive on panel bridges because their supports are fixed and independent relative to the movement of the liquid mass. Blast effect can equally affect certain elements of bridges stored on the ground near the places of employment or even far to the rear. However, it seems that strict discipline and studies of storage conditions would permit a reduction of these risks.

As has been said, the radius of blast effect varies within considerable limits according to the power of the weapon concerned and its altitude of burst. In particular, if the burst takes place on the ground, the shape of the terrain and existing obstacles can limit the damage greatly.

It can be concluded that the results of blast at a distance are:

Perceptibly none for masonry and reinforced concrete bridges.

Of little importance for metal bridges on fixed supports.

Very distinctive for floating bridges.

Contamination

The radiation effect is of short duration in an air burst. On the other hand, a surface burst (or one in water) lasts for weeks in the soil disturbed by the explosion. It follows then that a bridge struck by a surface burst cannot be reconstructed at the same location or the immediate vicinity for a long time. This will impose upon the engineer the problem of rebuilding the bridge itself and also reconstructing the approaches. This unquestionably will lead to a requirement for more equipment and will result in longer delays for construction.

In the case of an explosion in the water the entire river would be polluted downstream and its crossing would be more difficult than if the mass of water were larger. Furthermore, the duration of this dangerous radioactivity would be inversely proportional to the speed of the water. In other words, on a slow and easy-to-cross river the radiation effect would be more lasting, consequently reaping more profit for the defender. Finally, fixed bridges

which span the water will permit crossing with less delay than bridges floating in a radioactive mass of liquid.

Solutions

It appears that floating bridges are so vulnerable and their employment so risky that it will be necessary to use other means whenever possible. In the future, neither the air force, antiaircraft artillery, lack of visibility, nor smokescreens will be sufficient to protect them effectively. The effect radius of an atomic weapon is such that a single plane or a single guided missile will almost always be sufficient to put a floating bridge out of service at the first blow. To restore communications it will be preferable, therefore, to depend on bridges on fixed supports.

Since the time consumed in constructing this type bridge is very long they will have to be employed only on small rivers. They cannot be completed in time to be of tactical use on the larger ones. In this case it will be necessary on large rivers either to look for and prepare fords or to employ rafts and ferries. In general, fords can be built only on certain rivers and in very few places.

The employment of "submerged bridges" will be of interest, but they will allow only limited traffic. They have the advantage of being invulnerable to blast effect but are very sensitive to radioactivity in water.

The use of rafts and ferries as means of crossing, under favorable conditions, permits one to attain sufficient dispersion to avoid the destructive effect of atomic weapons. However, they have the disadvantage of a very small "yield" as compared to bridges.

One solution to the problem of river crossing in atomic warfare might be found in an improvement of this method. To do this it would be necessary for a great number of barges—adapted to rivers and capable of being placed quickly into operation—to be substituted for the present crossing means. During the last conflict, the special craft used in amphibious operations pointed the way toward a solution. The difficulty lies in designing and developing equipment which can be transported by road or highway and which is of a size and shape that will not obstruct the means of communication on which it is moved.

It would be ideal if these barges could move already assembled and under their own power. They would constitute true amphibious vehicles able to transport other vehicles to the far side of the river.

Most of the vehicles of larger units should be amphibious and, in order to provide sufficient mobility for these units, there would be a requirement for a great many of them. By making the greatest possible number of combat vehicles amphibious, armies of the future will be able to overcome the compartmentation of the terrain created by large rivers.

Unfortunately, it is out of the question at the present time to make all vehicles amphibious. The engineers still will have to fulfill, through their own means, the responsibility of crossing numerous vehicles. In this connection, heavy tanks will pose the most difficult problem.

Of course, it would be desirable if they too could be amphibious. During the last war many devices were developed to make them so, such as the attachment of floating gear, but this will not always be practical. Their mobility always will be limited by their weight.

Up to the present, in river crossing operations, the major task of the engineer has been the construction of bridges to give the commander a means for movement of his supplies. However, this process leads to the creation of concentrations which are extremely vulnerable to atomic weapons.

To overcome this situation it will be necessary to seek dispersion by the use of many crossing points. For small rivers

it will be possible to build many bridges, preferably on fixed supports. However, for the larger rivers this will require too much effort and time. For this reason more barges will have to be used in conjunction with more numerous embarkation and debarkation points along the river. This will result in a sizable task of reconnaissance and preparation of approach roads to the river. At the same time, it will require the operation of a system to aid vehicles which bog down or get in trouble during the crossing operation.

Engineer Units

In order to perform such a task engineer units must be very mobile and most, if not all, of their vehicles must be amphibious. They will have to operate the barges and be able to prepare approach roads and points of embarkation and debarkation rapidly as well as prepare and maintain fords.

In the organization of new units it will be necessary to remember that the war of tomorrow may be fought to a large extent by guerrillas and airborne troops. The World War II conception of the combat and communications zones also must be revised since, henceforth, the danger will be everywhere. River crossing operations will be as imperative and as urgent in the communications zone as in the combat zone. Continuous support by various engineer units and support of the combat zone by the communications zone must be adaptable to new situations.

Instead of being oriented in depth, from front to rear, the over-all organization now will be oriented in all directions. River crossings may have to be made in any direction. Concentration of means always will be the rule, but it must be obtained through dispersion. This will require very careful planning and a judicious allotment of tasks between units which will be located far from one another.

At the division echelon the engineer will be more mobile. He cannot provide all the barges necessary to cross the vehicles and tanks of his division. Consequently, it will be necessary for support units of superior echelons to furnish him the equipment he will need for this operation.

Conclusions

The value of rivers (as obstacles) appears to have been increased considerably by the advent of the atomic weapon. These allow the user to destroy military floating bridges very easily and in a single blow. In addition, it is possible to destroy, by ground bursts, permanent bridges far into the interior of a belligerent country. However, its power, even though enormous, seems insufficient to alter terrain and eliminate rivers as obstacles. In consequence, compartmentation of the terrain has never been as restrictive as it now is.

Today, two methods of river crossings are at our disposal: air transport and amphibious vehicles.

Considerable progress is available in the development of air transportation both by airplanes and by helicopter. However, for a long time, they will not permit one to avoid using land means of transport. There always will be a limit imposed by permanent installations and technical requirements. Employment of a great number of amphibious vehicles, therefore, will be a necessity.

It does not seem reasonable to assume that, in this new situation, the task of the engineers will be diminished. However, it no longer will be characterized by spectacular bridge building operations which, for the uninitiated, were the most tangible aspect of the engineer's activity.

In the future, even for large crossing operations, it still will be necessary for him to work in the dark, to organize, to foresee, and to plan complex maneuvers for the preparation of numerous crossing points, while at the same time controlling traffic, remaining constantly dispersed, and concentrating his efforts to accomplish his mission.

The German Sixth Army on the Way to Catastrophe

Translated and digested by the MILITARY REVIEW from a copyrighted article by Herbert Selle in "Allgemeine Schweitzerische Militärzeitschrift" (Switzerland) August 1956.

*The reader will recall the recent two-part article (*MILITARY REVIEW *Sep and Oct 1957) in which Colonel Selle vividly described* The German Debacle of Stalingrad, *picturing the deterioration of the once proud German Sixth Army under Hitler's impossible orders, loss of support, brutal weather, and the relentless pressure of a determined enemy. The following digest shows the tactical details of the advance to Stalingrad.—Editor.*

ON 30 JUNE 1942 the Sixth Army had left its jumping off point east of Belgorod, and was advancing for the attack. After two days of hard defensive fighting the Russian resistance appeared to be broken, and the German units went over to the pursuit. It appeared, however, that the Russian retreat was being conducted on the basis of previous plans, for during the delaying action of the withdrawal to the southeast not a single article of equipment was left behind and the number of prisoners taken was small. The extensive Russian minefields considerably slowed the German advance. But by 20 July 1942 the main body of the Sixth Army was astride the upper course of the Chir.

The Sixth Army South of the Don

The original German plan of operations had called for the conquest of the southern Russian area in chronological phases. First, Army Group B, with its Sixth Army and First and Fourth Armored Armies, was to seize Stalingrad and the lower Volga and establish a defense front between the Don and the Volga. After this, Army Group A was to seize the Caucasus area to the south. The German Supreme Command (Hitler) looked forward to the enemy's collapse as a result. It was fairly certain that the strategic objectives of this plan would be reached before winter, even though the result anticipated had to remain very doubtful, if not dismissed as purely Utopian.

However, in view of the successful advance of the Sixth Army, the High Command decided that the Soviet defense was so shattered already that only fractional forces were now necessary to bring about the collapse of the Don-Volga front. Under the impulse of this wishful thinking, the original operations plan was discarded and a new directive issued which allotted to Army Group B with its Sixth Army and Fourth Armored Army, the Don bend-Volga bend operations objective while, *at the same time*, Army Group A was assigned the mission of the conquest of the Caucasus area. The idea of any point of main effort was dissipated by this dispersal of forces.

The Battle of Kalach

On the basis of the manner in which operations had proceeded up to that point, and with the forces available, it seemed logical, in July 1942, that the Sixth Army would reach the crown of the great Don bend at Kalach in a few days. But many rapid moving, hard-hitting units, and a large quantity of transport matériel were transferred to Army Group A with the change in plans. At the moment (22-24 July) when everything depended on rapid action and concentrated effort, an armored division and two motorized divisions were left without transport and incapable of movement.

About the same time, the Russian Command obviously had decided to defend Stalingrad, not at the gates of the city but on the west bank of the Don, and on

25 July assembled forces in the hilly country northwest of Kalach. A battle took place which put the Sixth Army formations (which were in a critical situation with respect to supply) in a most difficult situation. The enemy not only brought forward his armored and infantry divisions at Kalach, but also those farther north

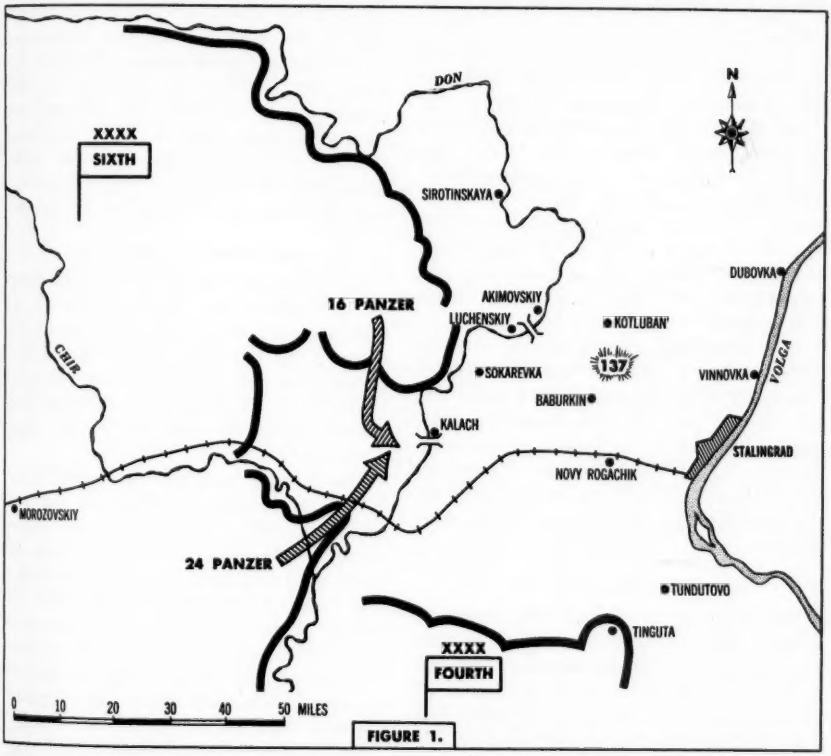


FIGURE 1.

in the vicinity of Akimovskiy across the Don. As a result of this, the Sixth Army was obliged to fight a battle on two fronts. It was forced from successful pursuit to defense.

The massed Russian attacks, supported by hundreds of tanks, eventually were repulsed.

After 10 days of the hardest defense fighting, supplies began arriving again on the German side. The divisions again began to receive motor fuel and ammunition from the supply bases hundreds of miles to the rear. The German Army gained the initiative. It saw the opportunity not only of beating the enemy installed in a broad, risky semicircle about Kalach, but of annihilating him by a double pincers action along the Don.

The attack began early in the morning of 7 August. About 20 hours later, the points of the 16th Armored Division (from the north) and of the 24th Armored Division (from the south) met on the heights west of Kalach. (Figure 1.)

The Russian Sixty-fourth Army and

the First Armored Army, cut off by this operation, capitulated three days later. The enemy—in addition to many casualties—lost 1,000 tanks and 750 guns. Fifty-two thousand Russians were taken prisoner. However, the combat strength of the Sixth Army divisions also had been seriously impaired. Their losses were felt more since replacements were not available.

On 29 July General von Paulus had declared that: "The army is too weak for the attack on Stalingrad." And a day later, the Chief of the Army General Staff, Major General Schmidt said: "The farther east we get the weaker we become." His urgent request for two or three infantry divisions was turned down. The combat strength of the Sixth Army was reduced still further on 10 August by the withdrawal of an armored and an infantry division.

The enemy had been beaten in a battle of annihilation. He had, however, gained time—which he employed in a most advantageous way—by his decision to prepare a defense position west of the Don. In view of his inexhaustible human reserves this gain of time was of greater weight than the losses he had suffered at Kalach.

Attack Across the Don

At dawn on 21 August two divisions crossed the Don in the face of violent enemy defense action. By evening they had secured a wide bridgehead. At noon, 22 August, the 16th Armored Division and the 3d Motorized Division of the XIV Armored Corps crossed the Don and made ready, in the bridgehead, for their attack eastward.

On the same day General Paulus declared:

We shall attack tomorrow from the bridgehead with all our forces, over Hill 137. If it succeeds, we must count on the mobile divisions alone remaining for a while on the hills northwest of Stalingrad. The 76th and 295th Divisions have little combat strength, so that their thrust will not be strong—particularly, we shall have difficulty in the matter of cover on the south. I repeat it once more, that we are two infantry divisions short.

This estimate of the commander in chief of the army was to find its full confirmation in the way the fighting progressed during the following weeks. The 16th Armored Division had 81 tanks at its disposal, and the 3d Motorized Division had 42. A few days later the 60th Motorized Division arrived with 40 additional tanks. Altogether, therefore, the Sixth Army had only 163 tanks for its attack on Stalingrad.

The Drive to the Volga

On 23 August the XIV Armored Corps drove forward over Hill 137 and to the east, securing itself with weak fractional forces in the Kotluban area against enemy action from the north. By 1700 the scout tanks of the 16th Armored Division were already south of Vinnovka on the steep bank of the Volga.

The terrain gain was deceptive, for a very large number of enemy groups still remained behind in the area passed through. The LI Army Corps, setting out from its bridgehead position, reached a line north of Baburkin with its 295th Division. (Figure 2.) Since interruption of the weakly held terrain bridge between the Don and the Volga could be expected during the ensuing night, air supply of the XIV Armored Corps was ordered.

On 24 August the Russians counterattacked with numerous tanks from the direction of Dubovka and Pan'shino. The Akimovskiy bridge across the Don was partially destroyed by Russian bomber attacks with the result that this military route was closed to traffic for two days.

The expected interruption of the highway east of Hill 137 was brought about on 25 August. The connections of the XIV

Armored Corps with the west were now broken. A combat team from the 60th Motorized Division, which was crossing the Don, was given the mission of opening the way to the east again. The 71st Division forced its way across the Don north of Kalach and took Kamyshevski. At the same time the 295th Division was progressing to the south.

The following figures show how matters stood with regard to the combat strength of a number of divisions:

The 376th Division, 28 percent; 398th Division, 32 percent; 384th Division, 30 percent; and the 305th and the 71st Divisions, 36 percent. They were reduced, therefore, to companies of from 40 to 50 men. In contrast with this the companies of the Russian infantry division showed strength of from 150 to 180 men.

The Outcome

The XIV Armored Corps was placed in such a threatening situation by a powerful, methodical Russian attack—from both the north and south—that the corps command proposed its Volga group move to a position back of Hill 137 during the night of 26-27 August, since the highway was now cut on Hill 137 itself. The Army High Command turned down this proposal very emphatically and demanded resistance *à outrance* until the LI Army Corps, attacking from the west, should bring relief.

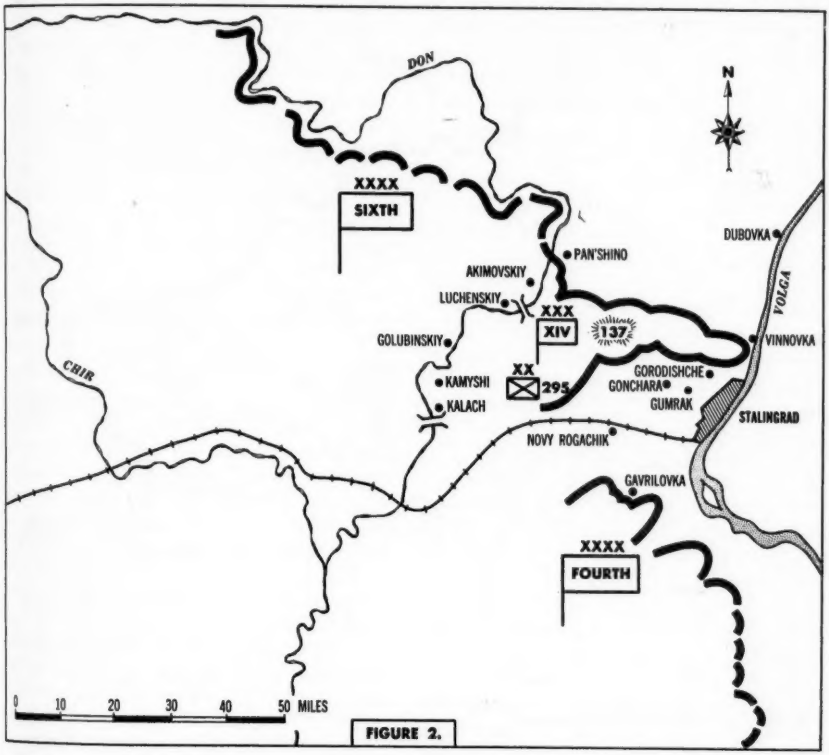


FIGURE 2.

This corps finally arrived on 29 August.

The drive against Stalingrad itself had to be halted. It was resumed again by an army group order on 30 August, since the Fourth Armored Army on that day had ruptured the Russian lines at Gavrilovka. For this reason the Sixth Army, in spite of the extremely critical defense situation, directed the XIV Armored Corps and the LI Army Corps to attack in a generally southern direction with the final objective of annihilating the enemy forces west of Stalingrad.

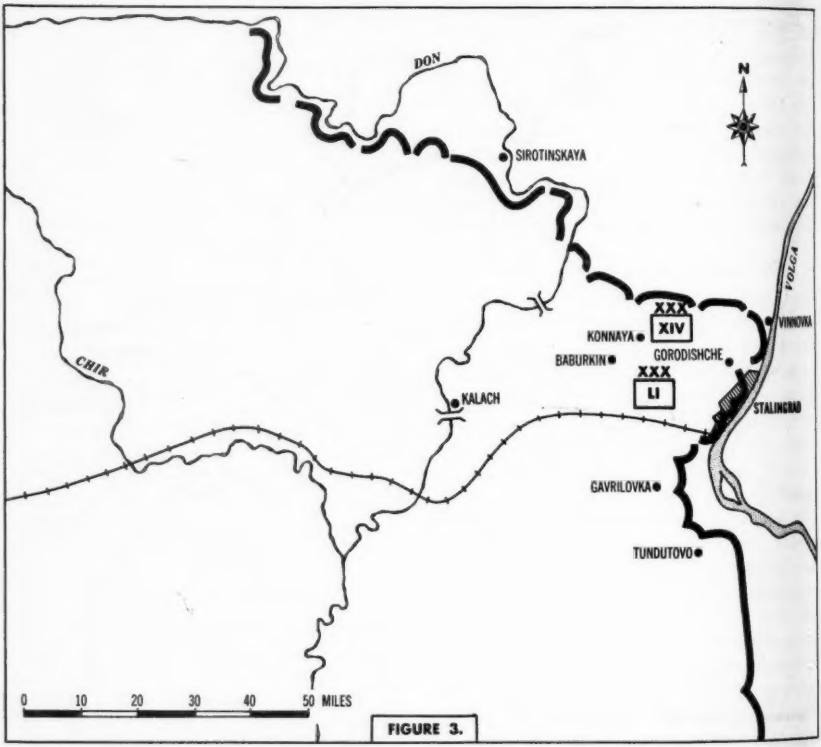


FIGURE 3.

While a strong Russian attack from the north—against the positions of the XIV Armored Corps—was repulsed on 2 September, the fractional forces of the 60th Motorized Division and 295th Division gained ground in the direction of Gonshara-Gumrak. Early on 3 September contact was established southeast of Gonshara with the 24th Armored Division of the Fourth Armored Army. Even though a considerable tactical success had been achieved, on the same day the northern front of the XIV Armored Corps again was badly overrun by the Russians. It was only possible to repel the Russian attacks at the cost of serious losses, and the use of the artillery of the 60th Motorized Division which was fighting with its front to the south.

An enemy attack of from nine to 10 infantry divisions and five to seven armored

brigades against the north occurred on 5 September. By the use of all available reserves and the expenditure of unusual quantities of ammunition—and at the cost, again, of very considerable losses—they were repelled.

The loss of 114 tanks on the Russian side did not, in view of the increasingly critical situation of the XIV Armored Corps, give rise to any illusions. The combat strength of the German armored infantry and rifle regiments visibly was disappearing; ammunition reserves were dwindling as a result of insufficient transport capacity. The mobile units of the armored corps were being worn down. Two days later the LI Army Corps succeeded in effecting a four-mile-deep penetration on both sides of Gorodishche, which on 9 September was widened in a northerly direction against a bitterly fighting enemy.

Toward the City

On 13 September the LI Army Corps set out to the southeast toward the heart of the city of Stalingrad, whose outlying areas were taken. On the following day, two divisions with about a one-mile front, forced their way through the city and all the way to the Volga. The main railway station fell into their hands. For the continuation of the attack on Stalingrad, on 15 September, three divisions of the Fourth Armored Army were placed under the orders of the Sixth Army.

The attack of the two corps gradually cut its way into the city in costly house to house fighting. (Figure 3.) In three days the LI Army Corps lost 61 officers and 1,492 men.

As the result of our own attacks and the repulse of the Russian counterattacks, the infantry forces between the Don and the Volga had become so weakened that the German Army High Command again requested additional units. Divisional combat strengths of from 500 to 800 men, including the officers and noncommissioned officers, were the rule. Finally it was agreed that three infantry divisions would be withdrawn from the southern front for the use of the Sixth Army. In addition to the need for more forces there was a growing shortage of ammunition for 10-centimeter and 7.5-centimeter cannon, and 8-centimeter mortars. The heavy mortar regiment was without a round of ammunition. The reverse of this was true in the case of the enemy, who had continuing reinforcement and supply.

On 23 September the Soviet tanks drove through the main line of defense in the east wing of the VIII Army Corps south of Kotluban, and cut the supply route north of Bal Rososhka, where they were destroyed on 25 September.

The impossibility of making up for the heavy losses of the frontline units, reduced to one-third or one-fifth of their original strength, the insufficient supply, and the continually increasing enemy resistance were matters which required halting the attack on the Stalingrad blood mill, and indicated the necessity for pulling back the front at least to the west bank of the Don. The objection that such a withdrawal movement was prohibitory because of Army Group A, which was fighting in the Caucasus, was without foundation, for its attack, too, was halted due to lack of forces.

Every attempt at resuming the attack thus far had failed in the face of the stubborn resistance of the numerically and equipment-wise superior enemy. The hopelessness of the prospect of being able to achieve the objectives assigned to Army Group A should have led to a withdrawal to the lower course of the Don or to the east side of the Crimean peninsula.

But the requests and proposals of Army Group B and of the Sixth Army fell on deaf ears. Serious opposition to Hitler's measures, as leader, had, up to this point, led only to the deposition of the objectors. And so, for the Sixth Army the trail was blazed to catastrophe.

Operations of Marshal Von Manstein in Southern Russia December 1942 to March 1943

Translated and digested by the MILITARY REVIEW from an article by Colonel E. Léderrey in "Revue Militaire Suisse" (Switzerland) October 1956.

ON 21 NOVEMBER 1942 the Sixth German Army was shut up in Stalingrad by the junction of the Soviet army groups of Rokossovski and Yeremenko. There appeared to be some chance that the 265,000 men who composed it would be able to break out. Their commander, General Paulus, wanted to try it. Hitler, who believed his prestige to be at stake, opposed the idea. For more pertinent reasons Marshal von Manstein approved this veto.

Von Manstein, the man for critical situations, had just been recalled from Leningrad and placed at the head of a group of armies—the group of armies of the Don. He had at his disposal only the Sixth Army, with which contact had to be established, and a few disorganized units which clung with great difficulty to the Don between Kotelnikovo and the Chir.

In the Don bend, stretched out along the west bank of the Chir, General Hollidt's army detachment had gathered together the debris of the Third Romanian Army that had been routed by the army group of Rokossovski. To Hollidt's three badly battered infantry divisions was added the XLVIII Armored Corps which was hardly in any better state. Its 22d Armored Division had Czechoslovakian tanks, about half of which were ineffective; the drivers of the 1st Romanian Armored Division were not yet masters of their German tanks; and his two Luftwaffe divisions were made up of personnel who were not well-trained in ground combat.

The headquarters of the Fourth Armored Army and the remnants of the Fourth Romanian Army, which had been thrown back toward the southwest, were located between the Don and Elista where the 16th Motorized Division of the First Armored Army (Caucasus) was isolated.

Therefore, Von Manstein found a front on the point of collapse.

To authorize the Sixth Army to evacuate Stalingrad immediately would have been to jeopardize the marshal's mission before he had had time to assemble the forces necessary for its execution. Although encircled, it was immobilizing no less than about 90 enemy divisions. General Paulus, assailed on all sides, had to prevent the Russians from overrunning him and pushing on to Rostov—a catastrophe that would not only have imposed the abandonment of the Don bend, but also the cutting of the principal communications of the forces occupying the Caucasus.

One understands, therefore, why the marshal sided with the Führer for the time being. The Sixth Army had to hold its ground in Stalingrad until forces could be gathered together to make it possible to counterattack.

The Attack

At that time the first elements of the 6th Armored Division were unloading under enemy fire at Kotelnikovo with 20 heavy armored cars, 42 assault guns, and 160 *Tiger* tanks. For the first time *Tigers*, from which Hitler was expecting sensational exploits, were available. The 23d Armored Division, reduced by hard fighting to 20 tanks, was delayed by its wheeled vehicles which were bogged down in the mud 200 miles to the south.

The 17th Armored Division, with only 10 tanks, coming from the Orel area, did not enter the scene until the second phase of the attack.

Marshal von Manstein had thought of

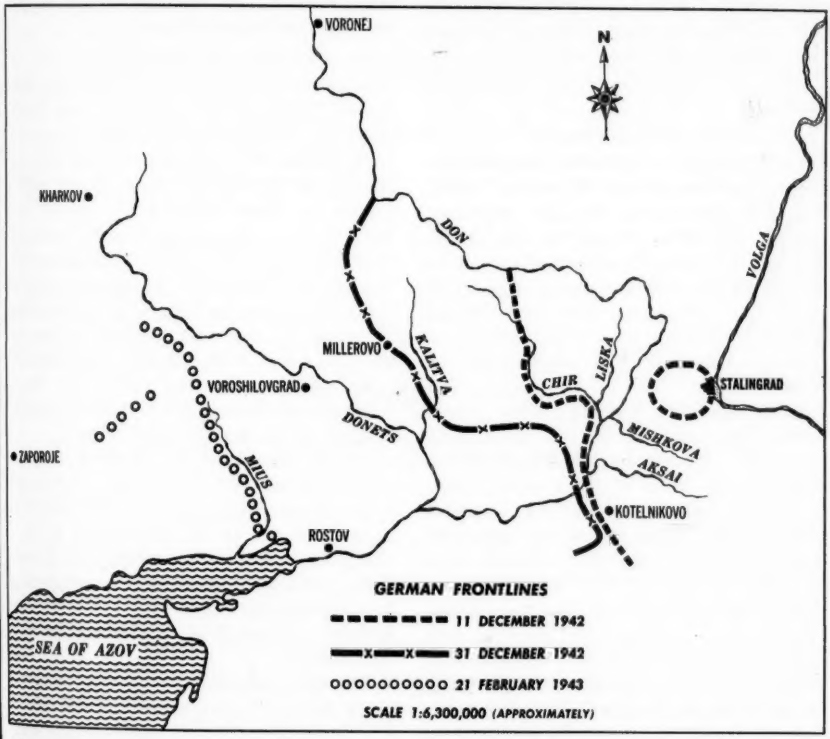
striking at Stalingrad along the two banks of the Don but he was prevented by the situation north of the river. The enemy there was exercising heavy pressure on the defenders of the Chir, while his forces seemed less considerable on the opposite bank of the Don where, in addition, the terrain seemed likely to lend itself better to the maneuvers of the tanks. It was, therefore, along the axis of the Kotelnikovo-Stalingrad railway line that Von Manstein directed the Fourth Armored Army to attack.

On 12 December the Fourth Armored Army attacked with the remains of the Fourth Romanian Army, a Romanian corps, and two understrength German armored divisions. Surprised at the weak resistance it encountered the first day, the entire line progressed some 18 miles.

The following day the Aksai River was reached, but the tanks that crossed it ran up against twice their number from the Soviet Third Armored Army, which drove them back across the stream.

From 14 to 16 December one of the greatest tank battles of the war took place with 200 German tanks opposing 300 to 400 Russian armored vehicles. The next day, with the arrival of the 17th Armored Division, a slight advance was made, and on 19 December, the 6th Armored Division succeeded in crossing the Mishkova River.

At this time junction with the Sixth Army in Stalingrad seemed possible, pro-



viding the latter cooperated by a sortie toward the southwest. Manstein ordered this, and Hitler authorized it, but, on the prohibitive condition of not abandoning the city.

However, on 21 December, when the Fourth Armored Army resumed its effort in the hope of fulfilling its mission, it was not the Sixth Army it saw coming out to meet it, but a new Soviet army. In spite of this, two days before Christmas two armored divisions were across the Mishkova and only 30 miles from Stalingrad.

Contradictory Orders

On that day, two mutually contradictory orders reached the Fourth Armored Army. The first demanded continued exploitation in the direction of the city where General Paulus had accomplished little toward an attempted sortie. A few hours later, the second order withdrew the 6th Armored Division and dispatched it to reinforce the Hollidt detachment on the Chir.

On 18 December Vatutin's Soviet army, which was engaged to the north, had broken through the Eighth Italian Army. With the exception of the Italian Mountain Corps he had dispersed it to the west and south and it had virtually disappeared from the field of battle. A 200-mile gap had been created between Voroshilovgrad and Voronej and there was no reserve available with which to fill it. This permitted Vatutin to attack the defenders of the Chir from the rear, obliging the Hollidt detachment to pull its forces away from the upper course of the stream and to bend its left wing back, in a defensive hook, along the railway line facing north.

A new encirclement, still more dangerous than the first, now threatened both the group of armies of the Don and the First Armored Army.

Vatutin encircled two weak divisions at Millerovo, reaching the Donets and the railway line which leads to Stalingrad. For a time he even occupied the rear area airbase which was indispensable for the supply of the Sixth Army. Arriving opportunely and recovering this airbase, the 6th Armored Division picked up still other elements which had been forced southward and, during the following days, drove them back across the lower Donets. This movement was facilitated by the 7th Armored Division's successes to the west of the Kalitva River.

Retrograde Movement

Deprived of its mainstay (the 6th Armored Division) and reduced to two weak armored divisions, the Fourth Armored Army found it impossible to hold its own against 12 Soviet divisions. In its withdrawal to Kotelnikovo, and then to the Manych River where it established contact with the 16th Motorized Division which had arrived from Elista, it left a large gap in the lines, thus permitting its adversaries to cross the Don and further aggravate the situation of the Hollidt detachment.

By mid-January the latter fell back to occupy the Donets River from its mouth to that of the Kalitva tributary.

By the end of the month the First Armored Army and the Fourth Armored Army had fallen back to the Donets. Stalingrad fell to the Soviets on 2 February. The capitulation of the city, which Hitler failed to prevent by conferring *in extremis* the grade of Marshal on its defender, initiated a new phase in the operations.

The four crushing blows dealt successively by the Soviet armies of Rokossovski, Yeremenko, Vatutin, and Golikov had been launched from a 400-mile front. Encouraged by their success, the Russians planned to launch a general attack along a front of 750 miles. It was planned to deal a mortal blow to the forces of the retreating Wehrmacht through the Ukraine and prevent them from regaining their equilibrium under the cover of the Dnepr. Hence Vatutin, whose Soviet armies were

closest to the Dnepr, with more haste than prudence was directed to hurl himself on this objective.

By 9 February he reached the Donets between Belgorod and Izyum. On the 12th he forced a passage, reached Voroshilovgrad, and obliged the German right to fall back behind the Mius. Intoxicated by this success, his armored and motorized columns pushed boldly ahead, unconcerned about the infantry which they left farther and farther behind. By 20 February they had overrun Kharkov and swung to the left to the gates of Stalino. Some of his tanks even reached Zaporozhye, seat of the Headquarters of the Southern Army group which had replaced the army group of the Don since 14 February.

Counterattack

Faced with the perspective of seeing the Mius position overrun from the north and retreat to the Dnepr cutoff, Von Manstein would have been quite warranted in being uneasy. Such was not the case, however. To be sure, he took the precaution of having the ice broken up on the river. However, far from thinking of continuing his retreat, from the moment the Russians had crossed the Donets the idea of setting a trap for them obsessed him.

Having reinforced the Kempf detachment to the west of Kharkov, and reorganized the Fourth Armored Army which had been placed in reserve at Stalino, on 21 February he launched simultaneous counterattacks from the west and south. A month later he was master of the Donets basin almost in its entirety.

For the second time Von Manstein had furnished proof that a marked numerical inferiority can be compensated only by skill of maneuver on the part of chiefs and units.

To Be or Not to Be?

Digested by the MILITARY REVIEW from a copyrighted article by Major N. B. M. Smithson, in "The Journal of the Royal Artillery" (Great Britain) October 1956.

IT HAS never been questioned that we will use tactical nuclear weapons in global war, and it has been openly stated that we will consider their use in limited war. Nevertheless, there seems to be a feeling that there still is the possibility, and a continuing one at that, of a future war being fought with conventional weapons —with the guns, tanks, and aircraft, suitably improved, of the last war.

The reasons for this feeling are broadly covered under two headings:

1. Moral objections to the possible use of nuclear weapons against forces not themselves in possession of these weapons.
2. A deduction that if both sides possess the weapon, mutual recognition of its effects will prevent its use—a sort of balance of power argument.

Of these two the former might be considered to have some merit on humanitarian grounds, but the latter none on any grounds.

The supporters of the policy of mutual restraint from the use of nuclear weapons are likely to be found among our more senior leaders; men who have seen two World Wars and experienced the devastation and economic ruin they bring to victors and vanquished alike. To them another war involving the vastly increased destructive power of nuclear and thermonuclear weapons presages the end of civilization. They fail to give enough weight to man's ingenuity and capacity to forget the unpleasant things of life.

The moral objections are harder to refute but we must be realistic. War itself

is unmoral, and we can never consider going to war except to repel aggression. Finally, and possibly the most important material point, is the fact that this nation cannot possibly afford to possess an army capable of being efficient in both conventional and nuclear war.

One of the major advantages of the nuclear weapon is its ability to discount superiority in numbers. Of all the great powers we are the least able to match quantity with quantity. We must rely on quality, and with nuclear weapons we have an opportunity, if properly handled, of matching and overcoming the superior numbers of our possible adversaries.

Cold War Task

One problem of great importance is the Imperial policing or cold war task. This will be with us as long as we keep members of other racial groups in subjugation. It is immaterial whether or not we rule for their eventual benefit.

Those territories in which the cold war problem arises have, it is true, police forces and in some cases military forces available with which to preserve order. The personnel of these forces, however, are unwilling to be used to stifle the aspirations of their brothers and sisters, aspirations with which they are themselves in sympathy.

Various suggestions have been put forward from time to time, and in some cases experimented with, to find a solution to the problem, but the only satisfactory solution appears to be to use existing military forces. These forces must come from our nuclear army and we must ensure that this army is organized and trained so as to be capable of fulfilling both of its tasks, cold war and hot war.

In a limited operation our aim is surely to prevent violence, and it is questionable as to whether our present equipment is best suited for the task. The need is for weapons and methods capable of causing incapacitation without permanent injury. Chemical warfare offers a solution to the problem and in the future chemical weapons may well be the only weapons of our cold war forces.

A further problem in connection with the cold war is the wide geographical separation between the home country and the danger areas as well as that between the areas themselves.

To prevent an undue proportion of our forces becoming tied up in these areas, we must have the maximum flexibility—this can be achieved only by the widest possible use of air potential for every type of move or operation. The air will be the medium for future movement, not the surface.

From the foregoing it is clear that our nuclear army must be capable of providing forces capable of fulfilling our Imperial policing or cold war requirements wherever and whenever necessary.

We are now in an interim stage of development. We can foresee the emergence of a variety of nuclear weapons, but for the present only in small numbers, and we realize that we must rely on the continued use of conventional weapons for a period.

A possible danger lies in any failure to appreciate the effects on tactics and strategy of the eventual full-scale arrival of nuclear weapons. They will change the face of war as we know it.

The time-honored phases of war are still taught and practiced; the attack and defense, the advance and withdrawal, in general the conventional movement of armored and infantry formations over ground. As a sop to the nuclear age a severely restricted use of these new weapons is superimposed onto our training and exercises. This is inevitable and in no way to be decried provided it is recognized for what it is—an interim measure. At the same time, as we are practicing the interim strategy and tactics necessary in a period of limited nuclear availability, we

must evolve a theoretical concept for use when nuclear weapons become the conventional armament.

Limited and Global War

The terms "limited" and "global" war may continue in use, but it would be unwise to imagine that there will be any great difference in tactical doctrine between them. As was mentioned earlier the United Kingdom is prepared to consider the use of nuclear weapons in limited war now, so there is little doubt that she would be prepared to do so in the future. The most likely difference between limited and global war is to be found in their geographical scope.

Korea has become the textbook example of a "limited" war, but whether it was its geographical remoteness, the lack of moral courage of the United Nations, or the fear of the USSR that kept the war from becoming "global" is difficult to say. The best definition of a limited war is probably: "a war geographically remote from the great powers in which there is no danger of a direct attack on their home bases."

The main difference between limited and global war so far as our military forces are concerned will be in the scale of their participation, the employment of thermonuclear weapons, and the involvement of the home base. None of these affect the tactics of our ground forces.

For hot war the army must be designed to use nuclear weapons to the maximum extent and at the same time withstand the attack of an enemy using similar weapons.

The Form of War

The military characteristics of nuclear weapons disclose certain limitations and it is in these limitations that we must seek the clue to the tactics and strategy of the future.

The area of devastation caused can vary from the almost limitless effects of large thermonuclear bombs to the lesser effects of a kiloton weapon, but in no case can one envisage an area of destruction small enough to permit close support fire in the old conventional sense. There will be objections to the use of nuclear weapons in populated areas due to the impossibility of avoiding civilian casualties—this objection will be even greater in the case of troops operating in their homeland.

The introduction into service of guided and ballistic weapons of ever-increasing range has conferred a flexibility in the use of nuclear attack that has never before existed in war with the more conventional weapons.

Future war is likely to consist of an all-out assault phase followed by consolidation on the part of the aggressor, and an effort to survive, combined with retaliation, if possible, on the part of the victim.

The vital requirement is to be able to stop our opponent's ability to wage nuclear war at the earliest possible moment while at the same time maintaining some such ability, however small, ourselves.

The assault probably will be launched without warning, but it is to be hoped that future electronic developments will provide sufficient notice of the approach of hostile missiles for us to be able to launch our retaliatory measures. It is, however, unlikely that we will be able to escape the effects of enemy bombardment.

Our initial attack with thermonuclear weapons must include the nerve centers of the enemy and will produce vast areas of devastation. This unparalleled destruction will be valueless unless it can be exploited by ground forces—ground forces delivered into and around the devastated area in a matter of hours. They must have with them the power to engage enemy forces with tactical nuclear weapons, and will have to rely entirely on air support for their continued existence. In the widely separated areas attacked, they will en-

sure that all organized resistance is crushed, and will spread out to seize enemy guided weapon launching sites, airfield complexes, and industrial centers in order to stifle at the earliest possible moment the enemy's ability to continue thermonuclear attack against our bases.

A corollary to the provision of our attacking forces will be the provision at home, and in other important bases, of units organized and designed to survive the thermonuclear attack and defeat the enemy airborne exploitation.

The Requirement

We should now have a clear picture of our requirement for the more distant future:

1. An ability to deliver thermonuclear attacks anywhere in the world.

2. A warning system in our main bases to alert and set our retaliatory forces in motion.

3. Light, mobile, and hard-hitting airborne forces with tactical nuclear capabilities so positioned throughout the world that they can exploit our thermonuclear retaliation; are prepared to counter enemy airborne assaults against our homeland and other main bases; and are capable, with the requisite equipment, of undertaking cold war and Imperial policing tasks whenever and wherever necessary.

The detailed organization and tactics of the land forces required for these tasks cannot be clearly foreseen at this stage, but the emphasis must be on mobility and concentration of force. Any form of static or semistatic defense offers a nuclear target and cannot be entertained. Troops in the assault must converge at the last possible moment to avoid presenting a target. Their movement must be fast; a man on his feet will be too slow except when actually in contact with the enemy, or perhaps when operating within an area populated by enemy civilians. This latter condition may not apply in countries where life is held cheaply and the rulers are prepared to sacrifice large numbers of their own people.

Land forces will not be able to advance or retire over ground as in the past. Assaults will have to be by air and followed swiftly by the movement of entire formations to other areas also by air. Any concentration of large formations would immediately warrant, and no doubt draw, thermonuclear attack.

The main tactical concept which seems to emerge from these ideas is one of the employment of small units in considerable numbers, rather than any conventional grouping by regiments, brigades, and divisions.

Assaults will be planned and executed by forces far removed from the objective. The task, whatever it is—destruction, coercion or capture of civilians, or neutralization of enemy centers—may be performed and the forces performing it removed without ever contacting enemy land forces. This wide use of air potential will bring its own difficulties, for armadas of aircraft, however swiftly they fly, will be targets for nuclear and thermonuclear attack, and will have to move dispersed over wide areas and concentrate for only the smallest periods of time.

This all sounds very difficult and not at all like war as we know it today, but we must face it and start thinking now for the thermonuclear age which approaches on supersonic wings and the blast of rocket motors posing the question, "to be or not to be?"

Is the Thermonuclear Ballistic Missile the "Ultimate Weapon"?

Translated and digested by the MILITARY REVIEW from an article by Camille Rougeron in "Wehrkunde" (Germany) April 1957.

DURING the Suez crisis, Nikolai Bulganin wrote to the governmental authorities of France and England:

You have launched your navies and air forces against a country that had just been left by your own troops and had not had enough time to rearm. What would you say if others that neither needed Navy or Air Force to make you feel the impact of their bombs would use against your countries those missiles which you could not match and against which your whole defense system would be useless?

Twenty-four hours after this open threat by the heads of the USSR the French and British operations in the Suez were stopped. It certainly cannot be claimed that the cessation of hostilities was a result of the Soviet threat, but the fact that the threat was made is another of many indications of the increasingly important place being given to guided missiles. For the first time since World War II major powers are giving priority over all other weapons to the long-range ballistic missile. Great Britain already has taken steps to replace fighter aircraft altogether with guided missiles.

The thought of the employment of guided missiles for the bombing of targets beyond the ocean occurred for the first time in the plans of German engineers in Peenemünde. Their plans were for two-stage missiles. The top part with guiding instruments would continue in horizontal flight from the parabolic path of the first stage. With a starting weight of about 100 tons and a warhead of approximately one ton of TNT, it would have been possible to cross the Atlantic Ocean.

But even if it would have been possible to realize those plans, the bombing of the United States from German bases would not have affected greatly the final outcome of the military effort. It has even been questioned whether or not the expensive *V-2*, with its warhead of less than a ton of explosives, was worth the damage it could do. The value of two-stage missiles that could not assure a full hit is even more questionable. For this reason, even atomic warheads with about 10 kilotons of explosives would be too expensive. The difficulties end only when thermonuclear warheads of an effect of about 10 megatons can be employed.

Antimissile Missiles

On first thought it would appear impossible to ward off missiles that attack their target with a velocity of 5,500 to 7,500 miles an hour in a high angle of descent. In our opinion not enough attention is paid to present American efforts to develop an antimissile missile, and to the official reports about its chances of success.

At the beginning of 1957 the Chief of Staff of the United States Air Force, General Nathan F. Twining, gave his opinion about the future of planes and missiles. He said:

It will take a long time for the missile to replace the other weapons and even a longer time until it has the same possibilities a plane has. After both sides are in possession of those missiles they will soon have discovered all possibilities of defense. Our development in the construction of missiles serves in reality at the same time the development of a defense.

At present four antimissile missiles are in construction in the United States, two by the US Army and two by the Air Force. The idea of an antimissile missile is not new. It began with plan *Thumper* in 1944-45 at a time when the *V-2's* fell on London and Antwerp.

With a maximum range of about 180 miles, the *V-2* needed about five minutes to reach the target. The identification by radar, the determination of its flight path, and the calculation of the course of flight of the countermissile took the greater part of those five minutes. With that in mind, it appeared that the development of antimissile missiles would have to be given up. At that time it would have been impossible to build a missile that would have about twice the speed of a *V-2*, the speed necessary to intercept it.

The interception of long-range ballistic missiles does not encounter the same difficulties. It even has been maintained that the task of interception becomes easier with the increasing speed of projectiles. It would be easy to take the necessary steps for detection and calculations within the time of flight, which may exceed half an hour. Experience with the detection of Russian long-range missiles shows that it is possible to make out objects from great distances, whether they are as big as the whole missile at the beginning of the flight or as small as the explosive warhead at the end of the flight after the successive stages of the missile have been used up and thrown off. This relatively easy locating method relies upon the complex reactions occurring with the rush of the missile through the air. The reactions form a cloud of ionized particles around the missile and are excellent radar beam reflectors.

On the other hand, it is uncertain whether it is possible to make out projectiles of very small measures at altitudes of more than 200 to 300 miles, because the air above these levels is too thin for a sufficient ionization. It is sufficient, however, if the missile passes through this limit. Having several minutes at hand, especially if forewarned by the launching of the missile, it is possible to calculate the interception for an altitude of about six to 12 miles with sufficient accuracy even for antimissile missiles of lower speed than the attacking missile.

The use of nuclear explosives in the air defense simplifies the problem even more. To destroy the warhead of a *V-2* it would have been necessary to detonate explosives of about the same force as those in the warhead at a distance of several yards. The atomic or thermonuclear antimissile missile, with an explosive force of from several kilotons or even megatons, needs much less accuracy of course. For those missiles, altitudes of nine to 18 miles are envisaged in order to protect the earth from too much damage.

Recent experiments with explosions at great altitudes, however, disprove General Twining's inferences. Explosions on Bikini and Eniwetok were recorded by Japanese scientists to have reached altitudes of 21 miles. Admiral Lewis L. Strauss said, in July 1956, that these explosions are suitable for tactical application, particularly because it is possible to limit the effects of radioactivity without lowering the explosive force of the charge. The United States Department of Defense probably was convinced of the importance of such weapons because President Eisenhower mentioned them in his budget of 250 million dollars for the development of nuclear weapons.

Explosions at great altitudes make the fire control of the defense extremely difficult. An attacking missile of 20 megatons would have to be intercepted and exploded at an altitude of 60 miles if excessive destruction on the ground is to be avoided. This will be difficult. But should it be possible, one would only have to increase—in competition for the greatest explosive power—the explosive warhead to a force of 80 megatons. This would

bring the efficient defense altitude up to 120 miles without reducing the efficacy of the attack missile. Defense along this line, therefore, is useless.

With regard to the possibilities of destroying the missile itself, the same difficulties are encountered. It is not at all inevitable that a fast-moving, thick-walled bomb always will be destroyed by a nearby atomic explosion. Since the pressure effect is minimal at high altitudes, only the thermal effect, which is constant at all altitudes, is to be feared.

It has been observed time and again that the towers holding the bomb during tests were melted by the explosions. They had to absorb all the thermoradiation from the very close distance of some dozens of yards. But the different parts that make up a tower are comparatively thin. During the six-tenths of a second of effective heat radiation of a 20-kiloton bomb, however, the attacking missile will put a distance of two to three miles between itself and the place of explosion. Passing through the "ball of fire" the missile will be exposed to thermoradiations of only 1/20 or 1/30 of the strength that melted the towers.

Even the use of antimissile missiles with several megatons of explosive power and a ball of fire of one to two miles' size is not advantageous to the defense. The time of heat radiation will be longer, but as altitudes necessary for those explosions must be reached within four or five seconds the countermissile has to have about the same speed as the attacking missile. The point is important here because the passing of the rockets occurs at combined speeds of 10,000 to 15,000 miles an hour. At the end of the effective heat radiation the attacking missile will be at a distance of 40 to 50 miles from the point of contact.

In the dual competition for a stronger explosive force and for greater altitudes, the walls of the attacking missile will become inevitably stronger and stronger. Both will be advantageous to the aggressor whose missiles will pass through the fireball like a tiger through a burning ring, without singeing the fur. In our opinion this short discussion should be sufficient to show that the long-range ballistic missile fitted for explosions at great altitudes appears to be the real "ultimate weapon."

Antiaircraft Missiles

Although General Twining saw the future of the Air Force in competition with missiles from an optimistic point of view, the high command of the Army did not agree. They saw the deep changes that would follow the employment of intermediate range and intercontinental ballistic missiles in future war strategy much better.

Speakers of the Army declared that even if the antimissile missiles now in construction should fail in the defense against attacking missiles, they will, nevertheless, introduce a development in the interception of planes at the end of which the plane will lose completely its position as attack or defense weapon. Both the Army and the Air Force agree with General Twining that a dual progress in attack, as well as in defense, has to be expected from the construction of the ballistic missile. But the leaders of the Army face the consequences that seem to frighten the staff of the Air Force.

It must be admitted that this progress was inevitable. While they work in the United States with a type *Nike* that is able to bring down a bomber from an altitude of five to 25 miles, Russia is already employing IRBM missiles that are able to deliver their thermonuclear warheads to any target within 900 miles. The amount of interest shown on one side for the antimissile missile and for offensive missiles on the other is obvious. Another essential question arises here. Is it really so difficult to change a long-range ballis-

tic missile into an antiaircraft missile that is able to bring its nuclear charge close to the bombers when they are still several hundred miles away from their target? A *Jupiter*, refitted in this sense, will be able to destroy not only the supersonic jet plane at lower altitudes but also the fastest fighting bomber no matter how high it can fly. The *Nike-Jupiter* would provide the definite solution to the defense problem.

The thermonuclear explosion at high altitudes does not aim at the destruction of the enemy by means of a pressure wave. This would only start a race for greater altitudes of more than the 60 miles that are already envisaged for research purposes. These altitudes can be reached easily with the right equipment, and a plane with a speed of Mach 3 and more.

But even if the pressure effect is minimal at high altitudes the thermal effect remains constant. The explosion of a medium charge (one megaton for instance) will melt the strongest skin of a bomber at a distance of two or three miles. A charge of 20 megatons would increase the effective distance to 12 miles and for thin sheet metal up to more than 18 miles. Different from the offensive missile, the bomber does not have the natural antidote of great velocity that moves the missile several miles during the dangerous heat radiation.

In addition to the possibility of destruction of the plane, the crew is confronted with the equally great danger of being exposed in an environment that offers no protection to the radiation of gamma and neutron rays, the effect of which decreases like the thermic effect only with the square of the distance.

There are two aspects to bomber interception by long-range ballistic missiles fitted for thermonuclear explosions at great altitudes. They depend on the type of border the enemy has to cross.

Along a seacoast, in North America or at the coasts of the USSR for example, it is possible to employ defense missiles fitted with all the explosive force thought necessary for a sufficient accuracy of fire. The destruction of a bomber flying at altitudes of 15 to 18 miles above the sea represents a classical example for tactical employment of nuclear weapons.

Along a territorial border or front within a country, the problem presents itself from a different angle. If planes are intercepted by explosions of such force, the accusation of causing strategical destructions is inevitable. This could well mean a takeoff clearance for a general atomic war without specified targets. In order to avoid vast destructions in the affected territory, the explosive charge has to be reduced to a minimum. Even in this case, however, eventual employment of thermonuclear explosions at great altitudes could be the absolute solution. A charge of 100 to 150 kilotons could be used against a plane at an altitude of 12 miles. The explosion would take place at the altitude of 13 to 15 miles. The pressure effect and thermoradiation on the ground would still be within the limit of tolerance.

The employment of antiaircraft missiles would not only find bombers, but fighters as well to be rewarding targets. Why should expensive air defense units be kept if the thermonuclear missile assuredly destroys any advancing flying weapon at definitely lower cost than the traditional air force is worth? Development along this line started when England limited her contracts for fighters in January 1957.

Planes or Missiles?

Perhaps it is to be regretted that the missiles replace the plane at a time when bombers with speeds of Mach 2 and fighters with a speed of Mach 2.5 have just been developed. But a thermonuclear explosion cannot just be countered by

doubling altitude and speed. Neither the *B-58 Hustler*, the *F-104 Starfighter*, nor a whole row of other planes in preparation to follow these two into production will be able to survive. Of all these efforts spent in the last 10 years on the perfection of military aviation, nothing will remain but the satisfaction of having contributed to a speedup in the employment of passenger planes with a speed of Mach 2.

Traditional military aviation does not become obsolete by thermonuclear explosions of extreme power carried by missiles to every corner of the world. No, it has to leave the skies simply because its limited possibilities cannot be compared with the enormous weapons which have been brought into being. Not only the strategical but the tactical employment of these weapons will be made without regard as to whether the enemy chooses to employ them too. The plane will disappear even if missiles are employed purely defensively, and in a way that allows no protest, that is, for antiaircraft missions. The missile will envelop the opponent at a great distance with a ball of fire over the ocean without giving the opponent an excuse for a general atomic war.

The rules of air warfare will be changed completely by the long-range ballistic missile with a nuclear charge. This will mean the end for those who regarded strategical or tactical bombing and fighter defense as the main task of an air force.

Has an air force without medium or heavy bombers, without escort fighters, and without fighter squadrons any future at all?

The ballistic missile will not completely replace or abolish all this material. The missile renders only those planes unnecessary that fly at medium or high altitudes, but the possibility of low-level flight will remain because it cannot be intercepted by missiles with a nuclear warhead.

The air force will be able to give full attention to tasks that have been regarded as secondary until now, and therefore neglected. The transport of troops and war material will demand every possible effort, particularly in a time when tactical employment of nuclear weapons will disturb movement of ground forces considerably. The improvement of the helicopter, and of multiple-purpose and vertical takeoff planes will constantly increase the transportation potential, and still necessitate many engineers for successful development, many workers for production, and many crews for operation.

An avowed purpose of our preparations in atomic warfare is to develop a retaliatory capability so great that it will deter possible enemies from ever using nuclear bombs—just as fear of our retaliatory capacity deterred the Axis nations from trying gas or biological warfare, in spite of Hitler's avowed intentions.

Major General William M. Creasy

BOOKS OF INTEREST TO THE MILITARY READER

OPERATION DEEPFREEZE. By Rear Admiral George J. Dufek, United States Navy. 243 Pages. Harcourt, Brace, & Co., New York. $5.00.

BY LT COL HAROLD E. BEATY, *CE*

When the sun set below the horizon for the winter's night in the Antarctic, the airplanes, ships, and personnel of the American forces that had come to this icebound land to establish scientific bases departed. They left behind 169 Navy men to secure important scientific data. Seven outposts scattered throughout the United States zone of responsibility were manned, one of which was 10,000 feet high at the geographic South Pole and another on the Rockefeller Plateau. The United States was ready for her observations and investigations at this southernmost part of the world for the 1957-58 International Geophysical Year. The prelude to this important setting was the United States Navy's Antarctic expedition Operation *Deepfreeze*, its mission to furnish logistic support for the coming International Geophysical Year.

In a realistic manner and in simple terms, the author has given an interesting account of his personal adventures and observations in this story of the latest conquests of the Antarctica. The various human interest stories and life on the ice enhances the value of the book. The author became the first man to land at the South Pole by air and the first man to set foot there in 44 years.

GLOBAL STRATEGY. By Air Vice-Marshal E. J. Kingston-McCloughry. 270 Pages. Frederick A. Praeger, Inc., New York. $4.50.

BY LT COL FRANK E. BURDELL, JR., *Inf*

The difficult factors which face military scientists in meeting the threat of Communist aggression are analyzed here.

The author postulates that if war comes, the aggressors probably will have the advantage of selecting the place and geographical scope of the action and this, in turn, is likely to carry with it the advantage of determining the type of weapons which will be employed.

The author strongly supports NATO as a deterrent to aggression and urges that the Southeast and Middle East defense organizations be comparably strengthened.

Strongly emphasized are the advantages which accrue to the Communist nations by reason of the fact that in those countries, military, political, and diplomatic policies are concentrated and unified under a single command or control, whereas in the democracies these functions are separate and often poorly coordinated.

It is true that most of these problems already are well-recognized and doubtless have been experienced by our military strategists, but these subjects deserve constant repetition and analysis, particularly in the light of current efforts toward disarmament and other forms of international cooperation in the political-military field. The author's treatment of these problems is capable and thorough.

THE TWENTIETH MAINE. A Volunteer Regiment in the Civil War. By John J. Pullen. 338 Pages. J. B. Lippincott Co., Philadelphia and New York. $5.00.

BY LT COL FOSTER F. FLEGEAL, *Armor*

This account of a volunteer regiment in the Civil War begins at Fredericksburg and ends at Appomattox. It graphically portrays the restraint shown by the first regimental commander, young Colonel Ames, in the trying fall days of 1862 as he transformed the Twentieth Maine into a fighting unit.

As a fighting regiment they already had gained fame, but at Gettysburg the Twentieth earned its greatest fame. Holding the extreme Union left against successive Confederate attacks, the regiment stopped the Confederate advance, but at a cost of 130 out of 350 men.

Mr. Pullen refutes the contention that history must be dull. This is a superbly written book illustrated with excellent maps.

THE STATESMAN'S YEAR-BOOK. Statistical and Historical Annual of the States of the World for the Year 1957. Edited by S. H. Steinberg, Ph. D. 1,638 Pages. St. Martin's Press, Inc., New York. $8.50.

BY LT COL ROBERT M. WALKER, *Arty*

The 94th annual issue of *The Statesman's Year-Book* is a worldwide reference volume containing useful information on over 90 national states from Afghanistan to Yugoslavia, and from such tiny countries as San Marino and Andorra to the major powers of the USSR and Great Britain. It provides information and statistics on every country, principality, and territory in the world, including those behind the Iron Curtain and those which are not members of the United Nations. No reference library can be really complete unless it contains a copy of this carefully indexed compilation of current information.

WINSTON CHURCHILL AND THE SECOND FRONT. By Trumbull Higgins. 281 Pages. Oxford University Press, New York. $6.00.

BY LT COL HAROLD E. BEATY, *CE*

From the fall of France in late spring 1940 through the Casablanca Conference in January 1943, Sir Winston Churchill dominated the international scene through his aggressive leadership and skill in diplomacy. His proposed strategy to attack Nazi Germany through the Mediterranean area and consisting of flank attacks from the periphery was not accepted fully by the other Allies. This plan was in direct contrast to Russia's insistence for a second front and to the United States plan for an early all-out cross-channel assault upon Berlin by the most direct route.

This narrative is confined to the political and international struggles during the period 1940-43 and ceases upon the triumph of Churchill's philosophy of war in 1943. Mr. Higgins presents a careful study of Churchill's strategy and motives and attempts to present this outstanding man in a neutral light. However, the reader senses that the overpowering personality of Churchill even dominates the writer; he tempers admiration with fundamental criticism of his strategy.

In this skillfully written book the author has pointed out the extreme importance of the human element and philosophizes that generals and statesmen have the same personal weaknesses of other men, if only in differing form.

GEORGE WASHINGTON IN THE OHIO VALLEY. By Hugh Cleland. 405 Pages. University of Pittsburgh Press, Pittsburgh, Pa. $5.00.

PANZER BATTLES. By Major General F. W. von Mellenthin. Translated by H. Betzler; edited by L. C. F. Turner. 383 Pages. University of Oklahoma Press, Norman, Okla. $5.00.

U. S. MARINE OPERATIONS IN KOREA 1950-1953. Volume 3. The Chosin Reservoir Campaign. By Lynn Montross and Captain Nicholas A. Canzona, United States Marine Corps. 432 Pages. Superintendent of Documents, Government Printing Office, Washington, D. C. $2.75.

BY COL HEWITT D. ADAMS, *USMC*

This volume continues the high standards of the series. The authors do a remarkably effective job of drawing the "big picture" and of filling it in with interesting and lucid accounts of actions down to the squad level.

The book is particularly timely when we, as a nation, are engaged in soul searching and recrimination over our preparedness and fitness to meet the challenges of militant communism. This operation illustrates what American forces can do under circumstances that would have dictated a different outcome had our troops been soft and decadent. That the troops primarily involved were Marines is a matter of pride to the reviewer. That Army troops involved also demonstrated courage, hardihood, and fortitude is amply borne out.

If we are to be faced with local wars in areas of the enemy's choosing, our Armed Forces in the future can learn some valuable lessons from this campaign. The logistic difficulties and their solution might apply equally in certain areas of Southeast Asia. The role played by airpower in logistic and tactical support, while probably not that envisioned by the rabid airpower proponent, undoubtedly was a decisive factor in this campaign. In fact, the entire campaign from landing to evacuation is an object lesson in interservice cooperation. The four services worked together for the common aim with an effectiveness that could hardly have been improved.

The book should be studied by every professional military man.

THE SOVIET REGIME. Communism in Practice. By W. W. Kulski. 847 Pages. Syracuse University Press, New York. $8.00.

BY LT COL IRVING HEYMONT, *Inf*

Winston Churchill has stated that the Soviet Union is a riddle wrapped in a mystery inside an enigma. While the statement is a superb witticism, it also is only partly true. The secretive policy of the Soviet Government does make it impossible for an outsider to determine with certainty the inner political friendships and animosities within the supreme council of the Soviet State and the Soviet Communist Party. However, anyone who reads Russian has available in this country a wealth of authentic Soviet materials, the basic principles of the Soviet regime, and many details which reveal how these principles are placed into practice.

This book is a fully documented and factual account without reference to any foreign commentaries or second-hand accounts. By the liberal use of quotations, the reader sees the workings of the Soviet regime as seen by Soviet legislators, politicians, and authors.

Professor Kulski brings out the nature of the Soviet regime by discussing the cultural isolation and uniformity of the educated Soviet man, the relation of the citizen of the state, the Soviet worker and social stratification, the peasant and collective farming, and the developments of the post-Stalin period. He concludes that the Soviet regime is essentially unchanged despite the adjustments and undeniable improvements that have accrued since the death of Stalin.

This book is a valuable addition to the library of all military personnel, and provides the basic factual knowledge that is decisively important to those who are concerned with the present ideological struggle.

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Estado Mayor General del Ejército, Departamento de Informaciones, Santiago.

Colombia

Sección de Historia y Biblioteca del Estado Mayor General, Ministerio de Guerra, Bogotá.

Ecuador

Dirección de Publicaciones Militares del Estado Mayor General, Ministerio de Defensa, Quito.

El Salvador

Estado Mayor General de la Fuerza Armada, Departamento de Publicidad y Bibliografía, San Salvador.

Mexico

Escuela Superior de Guerra, Oficina de Divulgación Cultural Militar, San Jerónimo Lídice, D. F.

Nicaragua

Dirección de la Academia Militar, Managua.

Peru

Air Forces

Ministerio de Aeronáutica, Academia de Guerra Aérea, Lima.

Ground Forces

Ministerio de Guerra, Servicio de Prensa, Propaganda y Publicaciones Militares, Lima.

Portugal

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Uruguay

Biblioteca de la Inspección General del Ejército, Montevideo.

Venezuela

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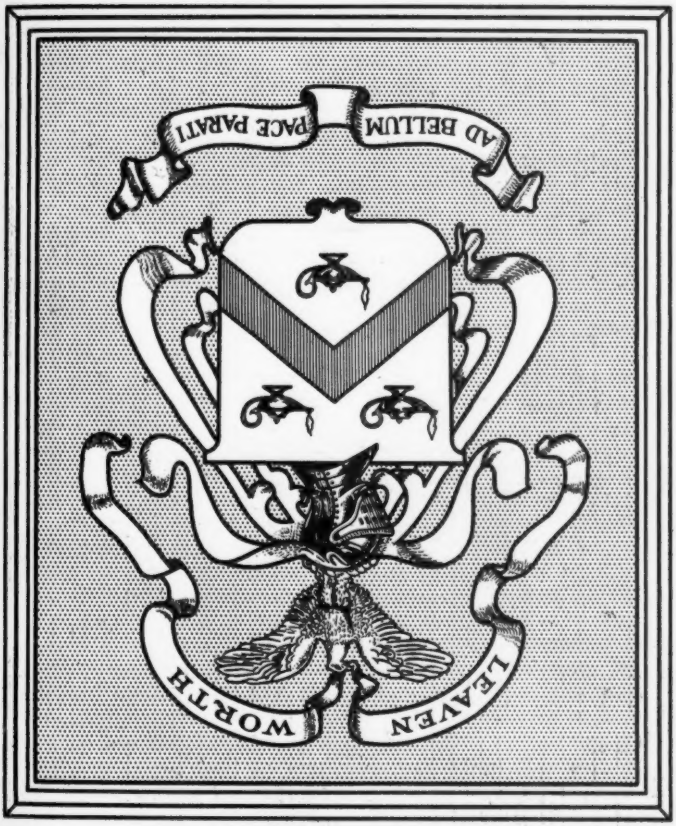
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